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SUMMARY OF FEDERAL AVIATION ADMINISTRATION RESPONSES TO NATIONA--ETC(U)
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U.S. Department of Transportation
Federal Aviation Administration
Office of Aviation Safety
Washington, D.C. 20591

Summary Of Federal Aviation Administration Responses To National Transportation Safety Board Safety Recommendations

Report No. FAA-ASF-81-5

Quarterly Report

July through September 1981

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16. Abstract

This report contains NTSB recommendations and all FAA responses to Board recommendations that were delivered to the Board during the applicable quarter. In addition, the report includes NTSB requests and FAA responses concerning reconsiderations, status reports, and followup actions.

The Table of Contents for this report reflects only those NTSB recommendations which are still open pending FAA action (i.e., those that have not been designated as "Closed" by the NTSB as a result of acceptable action). Accordingly, the Table of Contents may reflect a number of multiple recommendations (example: A-81-36 through 38), but background material is included only for those recommendations which remain in an "Open" status. Background information for those recommendations which have been closed is available in FAA Headquarters files.

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FOREWORD

The National Transportation Safety Board as established by Public Law 93-633, Title III, "Independent Safety Board Act of 1974," has among its duties the requirement to ". . . issue periodic reports to the Congress, federal, state, and local agencies concerned with transportation safety, and other interested persons recommending and advocating meaningful responses to reduce the likelihood of recurrence of transportation accidents and proposing corrective steps."

The Act specifies that whenever the Board submits a recommendation regarding transportation safety to the FAA, or other agencies of the Department of Transportation, that the agency shall respond to each such recommendation formally and in writing not later than 90 days after receipt thereof. The Act also requires that the response to the Board shall indicate the agency's intention to initiate adoption of the recommendation in full or in part, or to refuse to adopt such recommendation, in which case the response shall set forth in detail the reasons for the refusal.

A notice of each recommendation and the receipt of a response from the agency is published in the Federal Register. There is no requirement to publish either the recommendation or the response in its entirety.

The Federal Aviation Administration places a high priority on the evaluation of the Board's investigation and its recommendations. In recognition of the importance of these recommendations and the responses, the FAA, beginning with the first quarter of calendar year 1980, publishes quarterly reports of NTSB recommendations and all FAA responses to Board recommendations that were delivered to the Board during the applicable quarter. In addition, the report includes NTSB requests and FAA responses concerning reconsiderations, status reports, and followup actions.

The NTSB system of priority classification for action provides for documented NTSB followup action for each safety recommendation in accordance with one of the following classifications:

1. Class I - Urgent Action: Urgent commencement and completion of action is mandatory to avoid imminent loss of life or injury and/or extensive property loss.

2. Class II - Priority Action: Priority commencement of action is necessary to avoid probable loss of life or injury and/or property loss.

3. Class III - Longer-Term Action: Routine action is necessary so that possible future injury and loss of life and property may be avoided.

The purpose of this publication is to provide a systematic quarterly update and summation of NTSB Safety Recommendations and FAA actions and reponses. This document is intended to keep the public abreast of NTSB and FAA efforts in the area of aviation safety for the applicable quarter covered by the report.

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NEW RECOMMENDATIONS

Following is a listing of the 44 new recommendations received during the third quarter of 1981:

SUMMARY

Statistics for CY 1980 included:

115 new recommendations issued to the FAA

74 recommendations officially "closed" during this period

The following exchanges of NTSB/FAA correspondence concerning NTSB Safety Recommendations occurred during the third quarter, July 1 - September 30, 1981:

- FAA initial responses to NTSB recommendations: 19 letters involving 41 recommendations.
- FAA letters to NTSB discussing reconsideration of earlier responses, current status, or followup actions: 9 letters involving 36 recommendations.
- FAA "final report" letters to NTSB: 21 letters involving 57 recommendations.

Officially "Closed" by the NTSB during this quarter: 48 recommendations.

There were 2 FAA responses to 4 Class I--Urgent Action recommendations during this quarter.

Accident Date	Recommendation Number	Issue Date	Response Date	FAA Action
6/27/81	A-81-71 & 72	7/10/81	9/11/81	AD issued 7/16/81
7/31/81	A-81-85 & 86	8/7/81	9/11/81	AD issued 8/13/81

The FAA response to Class I - Urgent Action recommendations is reflected in the following summaries:

A-81-71 and 72

On June 27, 1981, an Aerospatiale AS350 helicopter, N1381BH, experienced a severe tail rotor vibration while in flight. The pilot was able to execute a successful emergency landing. The tail rotor vibrated because a tail rotor pitch change horn, PN350A12-1368-01, had failed as a result of fatigue cracking where it attaches to the blade root. Total operating time on the failed part was 950 hours.

The pitch change horn had no prescribed life limit. This recent failure occurred despite the operator's compliance with Federal Aviation Administration (FAA) Emergency Airworthiness Directive (AD) 81-13-09 dated June 16, 1981. This AD made Aerospatiale Telegraphic Service Bulletin 01.07A mandatory for all Aerospatiale AS350 model helicopters (173 AS350 helicopters are registered in the United States). The AD requires the following inspection criteria:

Within 10 flight-hours, remove the pitch change horns from the two tail rotor blades, thoroughly clean the mounting bolt areas of the horn flange, conduct a fluorescent dye penetrant inspection of the horns for evidence of cracks, thoroughly clean the mating surfaces of the horn and the blade root flange, and check for flatness of the mating surfaces by performing a trial installation. Once reassembled, conduct a daily preflight visual inspection of the pitch horns using a 5 power magnifying glass in the area of the mounting bolt countersink and adjacent radii of the yoke.

Although the pitch change horn on the accident aircraft had been inspected in accordance with the AD's directive, the existing fatigue area had apparently missed detection. The Board noted when examining the failed part that the horn surface had been cleaned but residue remained in the area of the fatigue cracks. The manufacturer indicated that a 400-hour service life for the PN350A12-1368-01 tail rotor pitch change horn was being considered. The Safety Board contended that this proposed action should be reviewed expeditiously to determine a proper life limit on the tail rotor pitch change horn. Accordingly, the National Transportation Safety Board recommended that the FAA take immediate action to revise the existing inspection instructions of AD-81-13-09 to stress the importance of thoroughly cleaning the pitch change horn in the area of the mounting bolt countersinks and adjacent yoke radii before performing the dye penetrant and visual inspections required. A second recommendation asked the FAA to expedite review of the recent failure history and existing flight-load data on the AS350, PN350A-12-1368-01, tail rotor pitch change horn and issue an Emergency AD to establish a life limit for the part.

The FAA reviewed the reported service problems and failures of the tail rotor pitch horn, PN350-A12-1368-01, and concurred in these recommendations. The French airworthiness authority issued an AD to require inspections and to establish a temporary 450-hour service life. This action duplicated the manufacturer's Telex Service Bulletins Numbers 01.07A and B.

The FAA took similar action and an immediately adopted rule AD, Amendment 39-4175, was issued on July 16, 1981. The provisions of this AD satisfied the intent of both recommendations, A-81-71 and -72. Subparagraph (d)(1) of the AD responds to Safety Recommendation A-81-71 and states: "Clean thoroughly, the surface of each horn at the two mounting bolts." Subparagraphs (g)(1) and (2) respond to Safety Recommendation A-81-72 in establishing a 450-hour service life.

Safety Recommendation A-81-72 also stated that the FAA should review existing flight-load data regarding the tail rotor pitch horn. The various Aerospatiale helicopter designs are type certificated under the import aircraft type certification provisions of FAR 21.29 and the bilateral airworthiness agreement between the United States and France. The agreement provides for FAA certification of the helicopter design predicated, in part, on the French airworthiness authority's certification that the design meets the applicable U.S. standards. Accordingly, and consistent with the provisions of paragraphs 5 and 6 of the U.S./French agreement, the French Airworthiness Authority and the type certificate holder continued to monitor this program and evaluate all available data, existing and newly acquired, to determine the validity of the current established life limit (450 hours) for both P/N's in the AD. If the evaluation and review support life limits other than that given in U.S. and French airworthiness directives, the FAA intends to initiate action to amend the AD accordingly.

By letter dated October 14, 1981, the NTSB expressed pleasure with FAA's action and classified Safety Recommendations A-81-71 and A-81-72 in a "Closed--Acceptable Action" status.

A-81-85 and 86.

On July 31, 1981, a Varga Model 2150A, N8423J, crashed near Bay Bridge Industrial Airport, Stevensville, Maryland, after control of the elevator was lost because of failure of the elevator horn assembly (P/N VAC 6000K-26). Both persons aboard the aircraft were killed.

Metallurgical examination of the elevator horn assembly revealed that the failure was a result of fatigue cracking in the mounting flanges of the horn. The fatigue initiated from multiple origins in the flange radius and propagated through approximately 75 percent of the right flange and 90 percent of the left flange before final separation. Although small portions of the fracture contained characteristics typical of high cycle, low stress fatigue cracking, most of the fatigue appeared to have propagated under relatively high loads. This indicates that the elevator horn assembly could have failed a short time after crack initiation.

Two smaller, secondary fatigue cracks were found in the top of the elevator horn assembly near the mounting flanges. These cracks initiated from near the aft edge of the horn where the channel is wrapped around the shim. The longer of these cracks extended approximately 3/8 inch forward from its initiation area. Removal of the paint layers from the flange area of the failed horn revealed multiple scratches in the metal. The alignment of these scratches indicates that the fatigue origin area had been sanded or perhaps filed.

A metallurgical examination was also conducted on five additional elevator horn assemblies from the following Varga model 2150A aircraft: N4638V, N4642V, N4617V, N4614V, and N4630V. Paint cracking in the flange radius areas was found on all of these horns except the horn from N4617V which was not painted. In addition, the horns from N4630V and N4642V contained fatigue cracks similar to the secondary fatigue cracks found on the accident aircraft horn.

As a result of these findings, the NTSB recommended that the FAA issue an emergency Airworthiness Directive (AD) to require that all P/N VAC 6000K-26 elevator horn assemblies installed on Varga aircraft be inspected before further flight and thereafter at appropriate time intervals. The Board suggested that horn assemblies be removed from the aircraft and the mounting flange areas stripped of paint. The upper aft corners of the channel bends and the mounting radii should then be inspected by an appropriate nondestructive test method. Horn assemblies found cracked, according to the Board, should be removed from service.

The Board further recommended that the FAA issue an AD to require that the flange area on all P/N VAC 6000K-26 elevator horn assemblies installed on Varga aircraft be visually inspected before each flight for cracking in the upper aft corners of the channel bends and in the mounting flange radius areas. Horn assemblies found cracked, according to the Board, should be removed from service.

The FAA concurred in these recommendations and issued Emergency AD 81-17-05, by priority mail on August 13, 1981. This AD required an inspection of the elevator for integrity and, if found to be cracked, replacement with improved parts. It also requires repetitive checks prior to each flight for a period not to exceed 10 additional hours' time in service, at which time the (steel) improved part is to be installed and the repetitive inspections required by the AD may be discontinued. AD 81-17-05 supersedes AD 79-15-06.

By letter dated October 7, 1981, the NTSB stated that AD 81-17-05 satisfied the intent of Safety Recommendations A-81-85 and A-81-86 and classified the two recommendations in a "Closed--Acceptable Action" status.

A-81-101 and 102.

On September 1, 1981, a Robinson R-22 helicopter, N9065D, crashed and burned in a wooded area of Granby, Connecticut; the pilot and passenger were killed. Investigation of the accident revealed that one of the main rotor blades separated in-flight. Preliminary metallurgical examination revealed a fatigue failure in the root area of the blade where the blade spar attaches to the root rib fitting. Fatigue had progressed across 70 percent of the blade's cross-section. The root area of the spar and fitting are completely enclosed by the external blade skin and cannot be inspected visually. Service time on the main blade, PNA016-1, was about 690 hours.

The Safety Boad expressed concern that other main blades on Robinson R-22 helicopters may be in the same condition. Accordingly, the NTSB recommended that the FAA issue an immediate AD to establish a retirement time on the Robinson R-22 main rotor blades based on the service time of the failed blade.

The FAA concurred in this recommendation. Airworthiness Directive (AD) 81-19-03 was issued by priority mail on September 4, 1981, establishing a retirement time of 300 hours total time in service for Robinson R-22 main rotor blades. By letter dated November 13, 1981, the Board stated that the issuance of AD 81-19-03 on September 4, 1981, fully satisfied Safety Recommendation A-81-101 and the recommendation was classified in a "Closed-Acceptable Action" status.

The Board further recommended that the FAA develop and implement an inspection technique for the main rotor blades to detect progressive fatigue in the area of the rib root fitting.

The FAA and manufacturers concluded that there is no reliable inspection technique that will adequately determine whether cracks have developed in the main rotor blade root fitting. As a result, the root fitting was redesigned and will be fatigue tested prior to establishment of a new life limit for the redesigned blade.

By letter dated November 13, 1981, the NTSB acknowledged the FAA's action and classified Safety Recommendation A-81-102 in a Closed--Acceptable Alternate Action" status.

A-81-124 through 127.

The NTSB investigated an in-flight accident involving a World Airways, Inc. DC-10-30 aircraft while en route from Baltimore-Washington International Airport, U.S.A., to Gatwick International Airport, U.K., on September 19, 1981.

The investigation indicated that a flight attendant was attempting to remove a service cart from the personnel lift in the lower galley when the lift started moving upward. The flight attendant became lodged between the top of the service cart and the top of the lift's doorway opening and as a result sustained fatal injuries.

The reason the lift started moving upward with the lower galley lift door open was not clear. An interlock system is installed to prevent energizing the lift motor and thus raising or lowering the lift while either the upper or lower lift door is open. However, investigation dislosed that lifts have been observed to operate with one of the doors open. The Safety Board expressed concern about the location of the electrical interlock switches. The switches are located in an area where they can be damaged by service carts or accidently activated by a flight attendant while trying to remove a service cart.

A review of the service history of the galley lift system revealed that in July 1979, the Douglas Aircraft Company issued Service Bulletin 25-266 following two instances in which operators had reported that the galley lift system had operated with a lift door open. The Service Bulletin stated that the electrical interlock switches had failed due to contamination by various types of foreign liquid substances. The Service Bulletin also stated that this condition could result in injury to flight personnel if the lifts are operated while the lift doors are open.

The investigation indicated that this Service Bulletin had been incorporated on the accident airplane, but the Board contended that, in addition to mandatory compliance of the Service Bulletin and interim procedures to prevent another accident, the design of the entire interlock system should be changed to eliminate the potential for damage to the interlock switches.

Investigation also indicated that the trapped flight attendant was not immediately released. Although the reason for the delay was not positively determined, the Safety Board expressed concern that the other flight attendants may not have been sufficiently knowledgeable about the lift circuitry design and emergency operational methods to have effected a release.

Accordingly, the NTSB recommended that the FAA issue an Operations Alert Bulletin to all operators of DC-10 aircraft, notifying them of the circumstances of this accident and informing them to implement procedures or temporary circuitry changes which would prohibit flight attendants in the main cabin service center from activating the galley personnel lift upward from the lower lobe galley, without verbal confirmation that all personnel are clear and the lower lift door is closed.

The FAA concurred in the intent but not in the substance of this recommendation. The FAA declined to initiate any changes to the DC-10 galley personnel lift circuitry until a thorough review of all safety implications involved in such changes had been completed. Also the agency expressed opposition to verbal communications as the principle lift operating procedure, because the interphones are too busy now, and the pressures of providing good service render such an approach unrealistic. Moreover, circuitry changes that would negate control of the personnel lift in the galley service center could have an adverse impact on the rescue of attendants who might become incapacitated in the lower galley.

The Board further recommended that the FAA issue an AD to require affected DC-10 operators to immediately comply with the Douglas Aircraft Company's Service Bulletin 25-266. The FAA did not concur in this recommendation. The World Airways DC-10-30 airplane involved in the fatal accident had the equivalent of Service Bulletin 25-266 installed at Douglas prior to delivery. The door interlock switch which failed was mechanically jammed in the actuated position. Though incorporation of S/B 25-266 would not have altered the final outcome of this accident, this aspect was considered as part of the total system review. The FAA noted that of the 13 incidents related to DC-10 cart/personnel lift malfunctions, dating back to Augsust 1973, only two involved contaminated switches.

An additional recommendation requested the FAA to require a redesign of the galley personnel and food cart lift doors and door frames to relocate the interlock switches to a position where they would not be susceptible to damage by food service carts, to inadvertent contact by personnel attempting removal of food service carts, and to contamination by foreign substance.

The FAA concurred in the intent of this recommendation. As part of the review referenced previously, the NTSB was informed that the following system design aspects are being studied for possible modification.

a. Modify circuitry logic so that the STOP button function takes precedent over depressed call button.

b. Modify "C" (cart) lift control system so that "C" lift can only be "commanded" from lower galley station and "directed" (called for or readied for sending to) from the service center.

c. Modify interlock switch installation to lessen susceptibility to damage from food/beverage service carts.

d. Retrofit of hermetically sealed interlocked switches on DC-10 airplanes not presently so configured.

Finally, the Board recommended that the FAA review DC-10 operator training programs for flight attendant personnel and flightcrews to assure that they include a description and discussion of the galley lift system including the electrical circuitry, location of circuit breakers, function of door interlock switches, and emergency operating procedures.

The FAA concurred in this recommendation and issued two Aircarrier Operations Bulletins. Air Carrier Operations Bulletin No. 1-76-12 - Flight Attendant Training Program in Aircraft with Lower Galleys and Air Carrier Operations Bulletin No., 1-76-13 - DC-10 Food Service Cart Lift address the NTSB's recommendation with the exception of electrical circuitry. The bulletins discuss the galley circuit breaker location, electrical control panels, safety interlock switches, and normal and abnormal operating procedures, and require that these items be included in the carrier's training programs. All regions, whose carriers operate any aircraft with lower galleys, have been requested to review their training programs and ensure the programs include the subjects listed in the air carrier operations bulletins. Electrical circuitry was not addressed because the FAA does not believe that electrical repairs or attempts to bypass safety system devices should be made by crewmembers. The electrical circuitry should be a function of the maintenance department with all repairs accomplished by a qualified technician.

The FAA issued a general notice (GENOT) to all regions requesting that each principal operations inspector review the procedures for those assigned carriers that have lower galleys. The carriers have been requested to perform a galley lift preflight check for proper operation of the door interlock system switches, normal control button sequence operation, and emergency stop button operating prior to each flight. Any malfunction should be recorded in the aircraft maintenance log and either repaired or proper dispatch procedures followed in accordance with the aircraft's minimum equipment list.

The FAA informed the Board of the findings by letter dated December 1, 1981. As of this date, no further response from the NTSB has been received.

US Department
of Transportation
**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave. S.W.
Washington, D.C. 20591

July 1, 1981

The Honorable James B. King
Chairman, National Transportation
  Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-81-35 issued by the Board on April 2, 1981. These recommendations resulted from the Board's investigation of the crash of a Douglas DC-3 near West End Settlement, Grand Bahama Island, on the night of September 12, 1980.

A-81-35. Require all aircraft used in revenue passenger operations which are not presently required to be equipped with an approved weather detection device under 14 CFR 121 or 14 CFR 135 to have an appropriate airborne weather detection device that is in satisfactory operating condition when flight under IFR or night VFR conditions is anticipated and current weather reports indicate that thunderstorms or other potentially hazardous weather conditions that can be detected with an airborne weather detection device may reasonably be expected along the route to be flown.

FAA Comment. The Federal Aviation Administration (FAA) recognizes that certain aircraft may operate without a weather detection device or airborne weather radar. Existing regulations require that these operators avoid hazardous meteorological conditions. FAA guidance material and advisory circulars (AC) clearly identify thunderstorms to be potentially hazardous meteorological conditions. Therefore, a flight must be cancelled or rerouted if thunderstorms are reported for the route of flight and no radar or detection systems were operable on the aircraft.

The Federal Aviation Regulations (FAR) and AC are very clear in their guidance for weather operations. An operator using aircraft without weather radar can safely operate if the rules and guidance are observed. FAR Part 135.67 contains the requirement that pilots report potentially hazardous meteorological conditions. FAR Part 121.599 requires that the pilot and/or dispatcher be thoroughly familiar with the weather on the route to be flown. FAR Part 135.69 and FAR Part 121.551 require a restriction or a suspension of operations if the operator detects a hazard. In all cases the pilot in command has the emergency authority to take the necessary actions to avoid encountering any hazardous meteorological conditions under FAR Parts 91.3, 121.559, and 135.19.

A letter has been sent to all FAA Regional Flight Standards Division Chiefs which requires additional emphasis on the surveillance of these operators with regard to compliance with the regulatory criteria. The letter instructs the regions to insure that the carriers that have aircraft not equipped with the weather detection device or weather radar understand the importance of avoiding hazardous weather conditions. The carriers are also to be informed that the FAA surveillance effort will include observation of how flights are conducted with reference to hazardous weather. A copy of this letter is enclosed for your information.

The FAA considers action completed on Safety Recommendation A-81-35.

Sincerely,

J. Lynn Helms
Administrator

Enclosure

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: April 2, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20594

SAFETY RECOMMENDATION(S)

A-81-35

On the night of September 12, 1980, a Douglas DC-3, owned and operated by Florida Commuter Airlines, crashed and sank in approximately 1,800 feet of water near West End Settlement, Grand Bahama Island. All 4 crewmembers and 30 passengers were killed.

The Safety Board's investigation of the accident has revealed that the aircraft was being operated in an area of forecast thunderstorm activity although it was not equipped with, nor was it required to have, an airborne weather detection device.[1/] This accident again focused our attention on the fact that the Douglas DC-3 is exempt from airborne weather detection device requirements of 14 CFR 121.357, 14 CFR 135.173, and 14 CFR 135.175 because it was certificated before the enactment of the Transport Category Rules. The Safety Board believes that this apparent regulatory gap contributed to an obviously unsafe flight operation. Thunderstorms and other forms of severe weather activity can be detected by airborne weather detection devices, thus warning the flightcrew of a potentially unsafe flightpath. The evidence indicates that thunderstorms were in the area where the aircraft was last reported.

The Safety Board is aware of and supports the independent review being conducted by the Federal Aviation Administration (FAA) and the Bahama Government of equipment requirements for large aircraft (as defined by 14 CFR Part 1) certificated before the enactment of Transport Category Rules.

The Safety Board believes that an airborne weather detection device is an essential system for the safe and efficient operation of all aircraft and therefore urges the Federal Aviation Administration to require all multiengine small aircraft having a passenger seating configuration, excluding any pilot seat, of more than 10 seats and all large aircraft which are engaged in passenger carrying operations to have an airborne weather detection device in satisfactory operating condition on board when hazardous

1/ As used herein airborne weather detection device includes airborne thunderstorm detection equipment (14 CFR 135.173) and airborne weather radar equipment (14 CFR 121.357 and 14 CFR 135.175).

weather conditions may be expected along the route to be flown. Such equipment is currently required only for large transport category aircraft and for small multiengine aircraft having passenger seating configurations (excluding any pilot seat) of 10 or more seats.

Accordingly, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require all aircraft used in revenue passenger operations which are not presently required to be equipped with an approved weather detection device under 14 CFR 121 or 14 CFR 135 to have an appropriate airborne weather detection device that is in satisfactory operating condition when flight under IFR or night VFR conditions is anticipated and current weather reports indicate that thunderstorms or other potentially hazardous weather conditions that can be detected with an airborne weather detection device may reasonably be expected along the route to be flown. (Class II, Priority Action) (A-81-35).

KING, Chairman, DRIVER, Vice Chairman, and McADAMS and BURSLEY, Members concurred in this recommendation. GOLDMAN, Member, did not participate.

James B. King

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

September 18, 1981

Office of the Chairman

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Reference is made to your letter dated July 1, 1981, responding to National Transportation Safety Board Safety Recommendations A-81-36 through -38 issued April 2, 1981. These recommendations stemmed from our investigation of an accident involving a Piper Model PA-20, near East Berlin, Pennsylvania, on November 26, 1980. The right wing separated in flight due to metal fatigue failure of the lower rear lift strut fork. Our comments follow:

A-81-36. Airworthiness Directive (AD) 80-22-15 is confusing and difficult to comply with. Thus many lift strut forks, like those installed in N7453K which had cracked prior to failure, are also likely to be cracked and installed in other airplanes. A lack of gross numbers of inflight airframe failure accidents, therefore, is not by itself indicative of the airworthiness of these parts. Your reference to a potential requirement for 72,000 forks as a result of this recommendation is not correct. That potential requirement was created when AD 80-22-15 was issued Indeed many of these forks have already been replaced.

In Safety Recommendation A-81-36 through -38 we did not question the maintenance records of Piper Model PA-20, N7453K. We merely stated that "Maintenance records indicate that the accident aircraft, N7453K, had been inspected in accordance with the April 25, 1980, directive and that the forks had been inspected magnetically." Despite the specific and direct efforts of the owner of N7453K to comply with this directive, both he and his family subsequently perished when one of the forks failed. It had not been given a proper magnetic inspection.

We have confidence in the new forks recently installed in these aircraft since they have been magnetically inspected by the manufacturer. Magnetic inspections performed in the field, however, have not proven reliable. These magnetic inspections should be performed by the manufacturer as proposed in Safety Recommendation A-81-38 and the currently installed lift strut forks should be replaced with new certified forks which have been similiarly inspected. We, therefore, request reconsideration of this recommendation which we are classifying in an "Open--Unacceptable Action" status.

A-81-37. We are satisfied with the FAA's proposed actions and await a further response. This recommendation is maintained in an "Open--Acceptable Action" status.

A-81-38. You indicate that a requirement to have magnetic inspections of the forks performed at Piper or other designated inspection stations could create unnecessary expense, inconvenience, and confusion. However, you also indicate that the more than 60 magnetically inspected forks received from the field were determined to be cracked when in fact none were cracked. This gross error in field interpretation of magnetic inspections was subsequently discovered when these forks were given a "proper magnetic inspection" at Piper and other facilities. This is precisely what the Board is recommending. Since AD 80-22-15 requires replacement of any forks determined to be cracked (and it may take weeks to get them), the inconvenience, confusion, and unnecessary expense referred to in your response is uniquely related to magnetic inspections performed in the field. This undesirable situation could be avoided if Safety Recommendation A-81-38 were implemented. We, therefore, request your reconsideration of this recommendation which we are maintaining in an "Open--Unacceptable Action" status.

Sincerely yours,

James B. King
Chairman

US Department of Transportation
Federal Aviation Administration

Office of the Administrator

800 Independence Ave. S.W.
Washington, D.C. 20591

July 1, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-36 through A-81-38 issued by the Board on April 2, 1981. These recommendations resulted from the Board's investigation of the crash of a Piper Model PA-20, N7453K, near East Berlin, Pennsylvania, on November 26, 1980. Safety Recommendation A-80-26 was issued on April 9, 1980, and also addressed wing lift fork fatigue problems in Piper aircraft. The FAA issued several airworthiness directives (AD) in response to that recommendation.

A-81-36. Issue an airworthiness directive superseding AD 80-22-15 to require that all lift strut forks currently installed on affected Piper aircraft, including forks with rolled threads, be replaced with new, certified, magnetically inspected forks. (This requirement need not apply in cases where such new forks have already been installed in accordance with AD 80-22-15.)

FAA Comment. The Federal Aviation Administration (FAA) does not concur in the conclusion that AD 80-22-15 and the preceding emergency AD's have not been effective in assuring airworthiness of the Piper Wing-Lift Forks. The fork AD has been in effect since April 17, 1980, and is applicable to about 18,000 airplanes. Since that date, only one fork failure has been reported. As the Board notes, the AD compliance record and service history for this particular fork were questionable.

We are aware that reference to the previous emergency AD's was omitted from AD 80-22-15. We subsequently reviewed this matter and concluded that a revision to AD 80-22-15 to reference the emergency AD's was not necessary. This determination was reached because the 180-day compliance time for replacement of forks with machined threads, as specified in the April 25, 1981, emergency AD, had already expired when AD 80-22-15 was issued. The procedure for distributing AD's has since been revised so that repair

stations now receive emergency AD's once every 2 weeks. Although it is unlikely that maintenance personnel would be unaware of potential lift strut fork fatigue problems, this possibility could have occurred since it is the responsibility of the owner/operator to insure compliance with emergency AD's.

We do not, however, agree with the conclusion that one failure, based on questionable records, casts doubt on the condition of all lift strut forks currently installed in some 18,000 airplanes. Visual examination of failed forks from Piper PA-20, N7453K airplane, revealed that both forks showed indications of cracks existing before failure, and a considerable amount of corrosion at the crack sites. This is confirmed in the NTSB Metallurgical Factual Report No. 81-23 dated February 20, 1981. As the NTSB indicates, log records for this airplane reflect that compliance with the emergency AD, dated April 25, 1980, was performed per paragraph (a)(3), which requires "magnetic" inspection. At that time the forks were classified as machine-cut threaded type. Since issuance of the fork AD, we have received more than 60 forks from the field which, according to the required magnetic inspection, were determined to be cracked. These forks were sent to Piper Aircraft Corporation, and to other sources, for the purpose of confirming the presence of cracks. With a properly performed magnetic inspection, none of these forks, in fact, was determined to have cracks and our experience indicates that the magnetic inspection is likely to indicate cracks when they do not exist. Therefore, rather than assuming that cracks were overlooked on N7453K during inspection, we are more inclined to believe that the inspection was not accomplished.

In view of our experience, we do not find a justifiable reason to require replacement of all forks as recommended in A-81-36. Replacement of these forks may involve 18,000 airplanes, creating demand for some 72,000 forks. This, in turn, could create unnecessary expense for owners and the small airplane industry.

In regard to replacement of forks for part (b) airplanes of AD 80-22-15, we have no justification for this action because we have no maintenance or defect reports which indicate problems with the forks on these airplanes. As you know, fatigue of metal elements depends not only on the method of fabrication of the parts, but also on the loading spectrum to which the part is subjected. The reason we have had no problems with the machine-cut threads on these aircraft since the issuance of AD 58-10-02, is probably due to the different loading spectra.

The FAA intends to take no further action on Safety Recommendation A-81-36.

A-81-37. Require manufacturers of rolled thread lift strut forks to be installed on Piper aircraft to identify them with a part number different from that of forks with machined threads.

FAA Comment. The FAA cannot require the manufacturer to identify parts by

an FAA specified method. Rather, any effective method is deemed acceptable. Piper elects to container-mark all lift strut forks because their experience has shown that subsequent operations after machining, i.e., plating, painting, etc., could cause the part identity to be lost. Further, container-marking ascertains receipt of the proper part when parts are replaced or shipped out as spares.

We do, however, agree with the intent of the recommendation, which is to provide the operators and mechanics in the field with better identification of parts with rolled threads. We will be meeting with Piper on or about July 6 to discuss this issue, and we will seek, (1) voluntary action to change the part number for parts with rolled threads or, (2) mark the parts to indicate the threads are rolled or, (3) both actions. We will inform the Board of action taken as a result of the meeting with Piper.

A-81-38. Specify that required inspections of lift strut forks on Piper aircraft (enumerated in AD 80-22-15) be performed only by manufacturers authorized to fabricate these forks or by other designated central inspection facilities having the requisite facilities and expertise.

FAA Comment. Maintenance of U.S. registered civil aircraft may be performed only by persons and/or agencies authorized under FAR 43.3, and is further limited by applicable portions of FAR 65, FAR 121, and FAR 145. For this reason, AD's seldom specify who may perform the work unless the provision is less restrictive in nature. To require small airplane owners/operators to have the inspections performed by manufacturers and only certain other designated inspection stations, could create unnecessary expense, inconvenience, and confusion. Accordingly, the FAA does not intend to pursue further action on this recommendation. However, we do intend to revise AD 80-22-15 for the purpose of simplification. The FAA considers action completed on Safety Recommendation A-81-38.

Sincerely,

Helms

J. Lynn Helms
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

Corrected copy

ISSUED: April 2, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-36 through -38

On November 26, 1980, a Piper Model PA-20, N7453K, crashed approximately 3 miles southwest of East Berlin, Pennsylvania, after the right wing separated in flight due to metal fatigue failure of the lower rear lift strut fork. All three persons aboard were killed.

In Safety Recommendation A-80-26, issued on April 9, 1980, the Safety Board directed the Federal Aviation Administration's (FAA) attention to several similar fatal accidents involving Piper aircraft. As a result, the FAA issued two emergency airworthiness directives (AD) dated April 17, 1980, and April 25, 1980, and AD 80-22-15 dated October 29, 1980, warning of potential fork fatigue cracking and failures. These directives required the replacement of machine (cut)-thread forks with forks having rolled threads within the next 50 hours or 180 days, whichever occurred first, and periodic dye penetrant and/or magnetic particle inspections of the forks. Maintenance records indicate that the accident aircraft, N7453K, had been inspected in accordance with the April 25, 1980, directive and that the forks had been inspected magnetically.

A review of AD 80-22-15 indicates that the directive is confusing and difficult to comply with and that it makes no reference to the previous emergency directives (which were effective upon receipt). Although AD 80-22-15 contains fork replacement requirements identical to those contained in the emergency directives (i.e., within the next 50 hours in service or 180 days), it has an effective date of November 3, 1980. However, discussion with FAA Eastern Region personnel indicated that the requirement for the 50-hour/180-day inspection period and the requirement for replacing with rolled-thread forks was intended to have been effective upon receipt of the first emergency directive issued on April 17, 1980.

Neither emergency directive was indexed in the FAA's biweekly listing. Therefore, unless the owner/operator recipients of the emergency directive advised them, maintenance personnel would not have been routinely aware of any potential lift strut fork fatigue problems before October 29, 1980, when AD 80-22-15 was issued. As a result, some affected aircraft given annual inspections between April 17, 1980, and October 29, 1980, were inadvertently certified as airworthy without complying with the emergency directives.

2905-A

AD 80-22-15 requires that maintenance personnel distinguish between lift strut forks with machined threads and those with rolled threads. However, there is no advice, method, or procedure contained in the AD (such as reference to appropriate magnification, thread gauge, etc.) to assist them in doing so. The mechanic who inspected the fork which failed in the accident aircraft incorrectly identified rolled threads as being machined threads. Comments from other mechanics indicated that they are experiencing similar difficulties in distinguishing rolled threads and machined threads. Therefore, the Safety Board believes that forks with rolled threads should have a part number different from those of forks with machined threads to simplify identification and to avoid the identification problem in future inspections.

The airframe maintenance log for the accident aircraft indicated that the lift strut forks had been inspected by magnetic means in June 1980. Examination of the failed fork, however, revealed extensive fatigue cracking across the face of the fracture and in several other thread root sections of the fork as well. It is unlikely that this fatigue developed in the interim between the June inspection and the accident. Rather, it appears that it was simply not detected during the required magnetic inspection performed in the field. Other similar field inspections have indicated cracked forks where no cracks actually existed. Because of the physical characteristics of the fork threads, considerable experience and expertise may be required in interpreting the results of the magnetic particle inspection. Therefore, the Safety Board believes that performance of the inspection should be limited to designated central facilities such as the manufacturer's plant, where fork inspection, metallurgy, and quality control can be closely monitored by specialists.

The Safety Board concludes that AD 80-22-15 and the preceding emergency directives have not been effective in assuring the continued airworthiness of these lift strut forks and that any effort to amend the AD would further complicate an already confused situation. The Safety Board believes that a new AD is needed to resolve the doubt which exists regarding the condition of all lift strut forks currently installed, including those with rolled threads. Consequently, the superseding AD should require the replacement of all existing lift strut forks with new forks unless such replacement has already been accomplished in compliance with AD 80-22-15. The periodic fork inspection and replacement intervals specified in AD 80-22-15 appear adequate and should be retained in the new AD.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an airworthiness directive superseding AD 80-22-15 to require that all lift strut forks currently installed on affected Piper aircraft, including forks with rolled threads, be replaced with new, certified, magnetically inspected forks. (This requirement need not apply in cases where such new forks have already been installed in accordance with AD 80-22-15.) (Class II, Priority Action) (A-81-36)
>
> Require manufacturers of rolled thread lift strut forks to be installed on Piper aircraft to identify them with a part number different from that of forks with machined threads. (Class II, Priority Action) (A-81-37)

Specify that required inspections of lift strut forks on Piper aircraft (enumerated in AD 80-22-15) be performed only by manufacturers authorized to fabricate these forks or by other designated central inspection facilities having the requisite facilities and expertise. (Class II, Priority Action) (A-81-38)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

Office of the Chairman

National Transportation Safety Board

Washington, D.C. 20594

July 27, 1981

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Thank you for your letter dated July 10, 1981, responding to National Transportation Safety Board Safety Recommendation A-81-43 issued April 13, 1981. This recommendation stemmed from our investigation of an inflight incident involving a deHavilland DH-114, southeast of Fort Myers, Florida, on November 17, 1980. Investigation revealed that the wing leading edge inspection plate located between No. 3 and No. 4 engine nacelles became unlatched, popped open and was partially torn off from the wing structure. We recommended that the Federal Aviation Administration (FAA) issue an airworthiness directive to require the latching mechanism on all wing leading edge inspection doors on deHavilland DH-114 aircraft be safety wired in accordance with Prinair's Engineering Order 923-1.

We note that the FAA is awaiting the manufacturer's assessment of the problem and will inform the Safety Board of intended action. Pending the FAA's further response, Safety Recommendation A-81-43 is maintained in an "Open--Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

US Department of Transportation

Federal Aviation Administration

July 10, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20954

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-81-43 issued by the Board on April 13, 1981. This recommendation resulted from the Board's investigation of an incident involving Air Miami Air Taxi Flight 421, southeast of Fort Myers, Florida, on November 17, 1980. The flight encountered an area of moderate turbulence and landed at Immokalee Airport with no injuries to crewmembers or passengers.

A-81-43. Issue an airworthiness directive to require that all deHavilland DH-114 aircraft wing leading edge inspection door latching mechanisms be secured in the closed and locked position in accordance with Prinair's Engineering Order 923-1.

FAA Comment. Several years ago the airplane manufacturer experienced similar problems with the leading edge inspection doors and issued a service bulletin to correct the problem. When the Federal Aviation Administration (FAA) discussed the NTSB recommendation with deHavilland (British Aircraft Corporation, Inc.), the manufacturer claimed no knowledge of recent service problems and was unaware of the Prinair engineering order (E.O.) calling for safety wiring of the doors. At that time, the FAA was informed by the manufacturer that the problem was again under review, including the Prinair E.O., with the ultimate goal of providing a modification.

Our review of the Service Difficulty System reveals that only two U.S. operators have lost leading edge inspection doors, neither incident having resulted in an accident. Although we could issue an airworthiness directive to require more positive latching by use of safety wire, there is no assurance that flight or ground loads will not eventually fail the safety wire. Accordingly, we believe it more appropriate to await the manufacturer's assessment of the situation; then notify the Board of our intended final action after further discussions with the manufacturer.

Sincerely,

J. Lynn Helms
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: April 13, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator-Designate
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-43

On November 17, 1980, Air Miami Air Taxi Flight 421, a deHavilland DH-114, operating for Air Florida, was being vectored at a point about 30 miles southeast of Fort Myers, Florida, when it encountered an area of light to moderate turbulence. The aircraft experienced "a moderate updraft followed by a severe downdraft" and continued to descend at a high rate with heavy buffeting. At the time, the copilot noticed a section of the right wing leading edge between the No. 3 and the No. 4 engine nacelles was missing. Rather than continue to his destination, the pilot elected to land at Immokalee Airport located about 3 miles away. The pilot landed the aircraft successfully without injuring any of the 3 crewmembers or the 13 passengers aboard.

Investigation revealed that the latch fastener arm on the right wing outboard leading edge inspection door moved out of position and the door opened upward into the slip stream, causing a "spoiler" type reaction and partial loss of aircraft control. A major portion of the door's upper structure also separated from the aircraft. The latching mechanism failure was probably caused by a combination of factors, such as flexing of the wing, air flow, or wear.

Prinair of Puerto Rico, operator of a fleet of 25 deHavilland DH-114 aircraft, and Caribbean Aircraft Development, Inc., (CADI), an overhaul facility for the DH-114 aircraft, has advised the Safety Board that a number of similar incidents have occurred and that partial loss of aircraft control had been experienced in each instance. CADI adopted a method of securing each inboard and outboard wing leading edge inspection door latch fastener arm and latch crossbar in the closed and locked position by using MS 9226-05 safety wire. Prinair has prepared and issued Engineering Order 923-1 covering this modification for the internal use of Prinair and CADI.

In view of the above, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an airworthiness directive to require that all deHavilland DH-114 aircraft wing leading edge inspection door latching mechanisms be secured in the closed and locked position in accordance with Prinair's Engineering Order 923-1. (Class II, Priority Action) (A-81-43)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

James B. King

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

August 11, 1981

Office of the Chairman

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Thank you for your letter dated July 15, 1981, responding to National Transportation Safety Board Safety Recommendations A-81-44 and A-81-45 issued April 16, 1981. These recommendations stemmed from our investigation of an accident involving a Bellanca 8KCAB Decathlon aircraft in Queenstown, Maryland, on March 7, 1979. Investigation revealed that the rear-control stick may have become entangled in the front seat aerobatic shoulder harness during full forward stick maneuvers.

Advisory Circular No. 43-16, General Aviation Airworthiness Alerts, Alert No. 36 of July 1981, fulfills Safety Recommendation A-81-44 which is now classified in a "Closed--Acceptable Action" status.

In response to Safety Recommendation A-81-45, we note that the Federal Aviation Administration will issue an airworthiness directive and take other actions to ensure the proper installation of safety restraint systems in the Decathlon aircraft. This recommendation is classified in an "Open--Acceptable Action" status pending its fulfillment.

Sincerely yours,

James B. King
Chairman

US Department
of Transportation
**Federal Aviation
Administration**

July 15, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-44 and A-81-45 issued by the Board on April 16, 1981. These recommendations resulted from the Board's investigation of the crash of a Bellanca 8KCAB Decathlon aircraft in Queenstown, Maryland, on March 7, 1979.

A-81-44. Immediately issue a General Aviation Airworthiness Alert warning Decathlon owners of the potential hazards to aerobatic flight when they modify Decathlon acrobatic restraint systems by attaching the shoulder harness to the seatpan frame and/or route the shoulder straps behind the seatback.

FAA Comment. The Federal Aviation Administration (FAA) concurs in this recommendation and has issued an Airworthiness Alert (copy enclosed). The FAA considers action completed on Safety Recommendation A-81-44.

A-81-45. Issue an Airworthiness Directive revising the Bellanca Decathlon FAA-approved flight manual for aircraft manufactured prior to 1977 to include the relevant cautionary information of section 2.1.9, "Occupant Restraint Systems," which is contained in subsequent approved flight manuals. An accurate description of the proper installation of the restraint systems should be included.

FAA Comment. The FAA concurs in this recommendation and we agree that altered safety belt installations and rerouted competition harness shoulder straps can create a potentially hazardous situation in Bellanca Decathlon aircraft. We have determined that many competition harnesses are installed after the aircraft has left the factory and this practice can lead to improper installations. In recognition of this potential problem, Bellanca proposed an amendment to the Decathlon (Model 8KCAB) FAA Approved Flight Manual in 1977, and the Flight Manual was subsequently revised accordingly.

We plan to issue an airworthiness directive (AD) to require an inspection that will assure that aerobatic "competition harnesses" are properly installed. We also intend to require an amendment to the Airplane Flight Manual, or Operating Limitations Placard, to provide instructions for the proper installation of these safety restraint systems.

We will forward a copy of any AD issued to the Board, and the FAA considers action completed on Safety Recommendation A-81-45.

Sincerely,

J. Lynn Helms
Administrator

Enclosure

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: April 16, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-44 and -45

The National Transportation Safety Board's investigation of the crash of a Bellanca 8 KCAB Decathlon aircraft in Queenstown, Maryland, on March 7, 1979, has revealed a hazardous condition which could affect the safety of flight of similarly equipped aircraft when performing aerobatic maneuvers. The pilot of the accident aircraft was practicing for his flight demonstration to obtain an "unlimited letter of competence" permitting aerobatics at and above ground level (AGL) when the aircraft crashed. He already held a "letter of competence" permitting him to perform aerobatics at and above an altitude of 200 feet AGL.

The investigation failed to disclose an aircraft mechanical malfunction, and postmortem examination of the pilot revealed no preexisting diseases. However, the aircraft's previous owner stated that during full forward stick aerobatic maneuvers the rear control stick had become entangled on occasion in the front-seat acrobatic shoulder harness where it was routed up the back of the front seat. He said that freeing the control stick was accomplished by releasing the front-seat narrow webbing lapbelt, thus releasing the shoulder harness. Additionally, a student of the fatally injured pilot said that earlier in the week the front-seat narrow webbing lapbelt had been slipping and had to be retightened between maneuvers.

The front seat of the accident aircraft, which was manufactured in 1972, was equipped with a dual-restraint system designed to provide restraint for normal and aerobatic flight. The front-seat restraint system consisted of a lapbelt of narrow webbing with a fabric-to-metal friction buckle. The lapbelt was attached to the seatframe at the seatback-to-seatpan intersection. The seat also was equipped with a narrow webbing, dual-strap shoulder harness which slipped over the lapbelt webbing. Each shoulder harness strap was modified from the original installation to attach to the seatframe at the same points as the lapbelt. The shoulder harness was routed up the back of the seat and through fabric shoulder harness guides at the top of the seatback. An additional lapbelt of wider webbing, equipped with a metal-to-metal buckle, was attached to the floor. Bellanca has indicated that the restraint systems described above were standard equipment for that model year. However, the shoulder harness straps were designed to attach at a single point to the overhead wing carry-through

structure rather than to the seat where they must be routed up the back of the seat. Later models of the Decathlon employ a lapbelt and single diagonal shoulder harness as the primary restraint system and a five-point aerobatic restraint system with the shoulder harness installed in front of the seatback and the inertia reel attached to the seatpan frame.

Thus, a potentially dangerous situation is created when the attach points of the aerobatic shoulder harness are altered on aircraft manufactured prior to 1973, such as was done in the accident aircraft, and/or when the shoulder harness straps are routed behind the front seatback. In fact, the propensity for owners to reroute the shoulder straps creating this hazard to aerobatic flight apparently was recognized by the Bellanca Aircraft Company. In May 1977, the company changed the FAA-approved Decathlon flight manual by adding a new section, "Occupant Restraint Systems," which contains the following caution: "DO NOT ALLOW SHOULDER HARNESS TO RUN UP BEHIND THE FRONT SEAT BACK WHERE IT MAY POSSIBLY INTERFERE WITH REAR STICK MOVEMENT." This section also notes that the aerobatic restraint system does not provide crash protection and therefore should always be used with the primary lapbelt and shoulder harness. This information should be particularly useful to owners of Decathlon aircraft built between 1973 and 1977 who presently may be unaware of the potential hazard.

The Safety Board believes that a modified aerobatic restraint system which permits the aerobatic shoulder harness straps to run up the back of the front seat as described above presents a potential hazard in aerobatic flight since this modification apparently can result in entanglement of the rear control stick with the front-seat shoulder harness.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Immediately issue a General Aviation Airworthiness Alert warning Decathlon owners of the potential hazards to aerobatic flight when they modify Decathlon aerobatic restraint systems by attaching the shoulder harness to the seatpan frame and/or route the shoulder straps behind the seatback. (Class I, Urgent Action) (A-81-44)
>
> Issue an Airworthiness Directive revising the Bellanca Decathlon FAA-approved flight manual for aircraft manufactured prior to 1977 to include the relevant cautionary information of section 2.1.9, "Occupant Restraint Systems." which is contained in subsequent approved flight manuals. An accurate description of the proper installation of the restraint systems should be included. (Class II, Priority Action) (A-81-45)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

James B. King

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594
August 11, 1981

Office of the Chairman

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Thank you for your letter dated July 16, 1981, responding to National Transportation Safety Board Safety Recommendations A-81-46 and -47 issued April 16, 1981. These recommendations stemmed from our review and evaluation of rotorcraft accidents involving dynamic rollover.

We are satisfied with the response to both recommendations and await the Federal Aviation Administration's (FAA) intended actions to disseminate dynamic rollover information to the aviation community. Pending the FAA's further response, Recommendation A-81-46 is maintained in an "Open--Acceptable Alternate Action" status and Recommendation A-81-47 in an "Open--Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

US Department of Transportation

Federal Aviation Administration

Office of the Administrator

July 16, 1981

The Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-46 and A-81-47 issued by the Board on April 16, 1981. These recommendations resulted from the Board's review and evaluation of civil rotorcraft accidents involving dynamic rollover.

A-81-46. Require single rotor helicopter manufacturers to analyze and define the critical slope angles of each model and include this information in the individual flight manuals.

FAA Comment. This phenomenon is not unique to single-rotor helicopters. The military has experienced dynamic rollover accidents very similar to the accident in question on shipboard with tandem-rotor helicopters. The critical slope angles for safe lateral slope landings vary with crosswind, lateral center of gravity, vertical center of gravity, landing gear geometry, rotor RPM, direction of tail rotor thrust relative to the slope, and for some helicopters, longitudinal center of gravity. While vertical center of gravity may not vary significantly for most helicopters, the other variables are most often significant parameters. The development testing required to develop and define critical slope angles for each configuration would impose a severe economic cost on the entire helicopter industry, without substantial benefit, as discussed below.

Virtually all prepared helicopter landing areas are level, while unprepared landing areas are often nonuniform in slope, and do not offer wind measurement information to the pilot. There are not many instances involving slope landing where the pilot would know the slope angle and effectively use such information to ensure a safe landing. Safe techniques for slope landings on unknown slopes are generally applicable to all helicopters and are adequately described in the FAA Basic Helicopter Handbook, Advisory Circular AC-61-13B. Based on these findings the Federal Aviation Administration (FAA) does not intend to pursue further action on Safety Recommendation A-81-46.

A-81-47. Include detailed discussions on helicopter dynamic rollover characteristics and corrective actions to be taken in: (1) the Basic Helicopter Handbook, (2) written examinations, (3) helicopter flightcheck oral examinations, and (4) any other publication deemed appropriate for the dissemination of safety of flight information.

FAA Comment. The FAA concurs in this recommendation and we agree that additional emphasis on public awareness of the hazards of slopes and obstructions during helicopter landings and takeoffs is justified. We have reviewed the Basic Helicopter Handbook, and the Airmen Written and Flight Test Guides. If these are followed, the procedures for slope takeoffs and landings contained in the Basic Helicopter Handbook should preclude rollover accidents. Also contained in this document are examples of common errors that can lead to loss of control. Written examinations for private and commercial pilot ratings cover slope operations. The flight test guides for commercial and airline transport pilots require demonstration of slope techniques. We find, therefore, that adequate information now exists, but some means to increase public awareness would be in the interest of safety. Accordingly, the FAA intends to develop information on the subject of dynamic rollover for dissemination to the aviation community.

Current planning provides for detailed information on dynamic rollover to be included in the (1) Basic Helicopter Handbook, (2) written examinations, (3) helicopter flight check oral examinations, and (4) a separate advisory circular (AC) on the subject.

It is anticipated that item 4 will be completed and issued by December 1981. This AC will be the basis for initiating action on items 1, 2, and 3. The Basic Helicopter Handbook and flight test guides will be updated at the next revision cycle. The helicopter written examinations are due for revision during CY 82 or early CY 83. Information on dynamic rollover will be distributed to individuals designated as pilot examiners during their attendance at training clinics conducted by the Examinations Standards Branch, Oklahoma City, Oklahoma.

We believe these efforts are fully responsive to Safety Recommendations A-81-46 and A-81-47. A copy of the appropriate documents will be forwarded to the Board as actions are completed.

Sincerely,

Helms

J. Lynn Helms
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: April 16, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator-Designate
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-46 and -47

On May 9, 1980, a Bell 206B helicopter, N90095, rolled rapidly to the right and crashed into the Gulf of Mexico during an attempted vertical takeoff from an offshore oil rig helipad. The pilot was killed; the two passengers were not injured. The Safety Board's investigation revealed that the right main landing skid had been momentarily snagged on the edge of a trap door located on the helipad. The abrupt right roll apparently was caused by the snag, and the pilot was unable to take corrective action to regain control because of the dynamic rollover characteristics of single rotor helicopters.

Dynamic rollover was initially identified during military helicopter operations involving sideslope landings and takeoffs. If a pilot is not attentive to roll attitude during the maneuver, a rolling moment can develop about a landing skid in contact with the slope. If the roll angle reaches a critical value, application of full opposite lateral cyclic will not be sufficient to prevent the helicopter from rolling over on its side. As a result of numerous occurrences of this type, the military safety organizations prepared and distributed information concerning the causes of this phenomenon and the corrective actions to be taken should dynamic rollover conditions be encountered; appropriate warning notices and the critical slope angles for individual helicopter models were also added to the flight manuals. As a result of these actions, the number of military helicopter accidents involving dynamic rollover has been reduced significantly.

A review and evaluation of civil rotorcraft accidents from 1974 through 1978 indicate that about 20 percent of the 101 rollovers listed had conditions present which could have resulted in dynamic rollover. The Safety Board is concerned that the civil helicopter community has not been adequately warned about conditions which can lead to this phenomenon. As was evident in this accident, a takeoff from a sideslope is not a prerequisite for dynamic rollover. Any condition which causes the helicopter's attitude to reach its critical roll angle with one skid in contact with the ground before the pilot recognizes the problem can lead to this type of rollover accident.

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Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require single rotor helicopter manufacturers to analyze and define the critical slope angles of each model and include this information in the individual flight manuals. (Class II, Priority Action) (A-81-46)

> Include detailed discussions on helicopter dynamic rollover characteristics and corrective actions to be taken in: (1) the Basic Helicopter Handbook, (2) written examinations, (3) helicopter flightcheck oral examinations, and (4) any other publication deemed appropriate for the dissemination of safety of flight information. (Class II, Priority Action) (A-81-47)

KING, Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations. DRIVER, Vice Chairman, did not participate.

James B. King

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594
August 11, 1981

Office of the Chairman

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Please refer to your letter dated July 17, 1981, responding to National Transportation Safety Board Safety Recommendation A-81-48 issued May 5, 1981. This recommendation stemmed from our investigation of an accident involving an Aerotek Pitts Special S2S, near Olathe, Kansas, on May 7, 1980. We recommended that the Federal Aviation Administration (FAA):

> Include in a future revision of the Airman Information Manual (AIM), Basic Flight Information and ATC Procedures, Chapter 7, Medical Facts for Pilots, a brief discussion of the physiology of aerobatic G forces as explained in FAA-AM-72-28.

We are pleased to note that the FAA not only agrees with this recommendation but that it is taking additional actions towards its fulfillment in the form of an Advisory Circular. We thank you for your offer to keep us informed of significant progress. Safety Recommendation A-81-48 is classified in an "Open--Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

US Department
of Transportation

**Federal Aviation
Administration**

July 17, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-81-48 issued by the Board on May 5, 1981. This recommendation resulted from the Board's investigation of the crash of an Aerotek Pitts Special S2S, near Olathe, Kansas, on May 7, 1980. The Board believes the pilot may have experienced physiological incapacitation as a result of G forces encountered while performing aerobatic maneuvers.

A-81-48. Include in a future revision of the Airman Information Manual (AIM), Basic Flight Information and ATC Procedures, Chapter 7, Medical Facts for Pilots, a brief discussion of the physiology of aerobatic G forces as explained in FA-AM-72-28.

FAA Comment. The Federal Aviation Administration (FAA) concurs in the intent of this recommendation, and we believe that information about effects of aerobatic G forces should be readily available to the pilot. FAA-AM-72-28 addresses this subject, but in the interest of safety, we intend to take appropriate steps to insure wider dissemination of the information.

In accordance with Safety Recommendation A-81-48, the FAA is preparing a brief discussion of the physiology of aerobatic G forces for inclusion in a future revision of the Airman Information Manual (AIM). Since inclusion of all the desired information will not be possible in this brief summary, we also plan to prepare an Advisory Circular (AC) on the effect of G forces on the pilot during aerobatics. Information for use in this AC is currently being accumulated at the Civil Aeromedical Institute (CAMI) through investigation of accidents related to aerobatics, and by review of literature related to centrifuge and flying experience applicable to aerobatics.

We will inform the Board of significant progress as our efforts continue in this area.

Sincerely,

J. Lynn Helms
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 5, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-48

On May 7, 1980, during a practice aerobatic flight, an Aerotek Pitts Special S2S crashed near Olathe, Kansas. Even though this investigation is still in process, the National Transportation Safety Board has reason to believe that the pilot may have experienced physiological incapacitation as a result of G forces encountered while performing aerobatic maneuvers.

The pilot had completed his "known" sequence of 18 maneuvers. At the suggestion of an observer, a regional aerobatic judge who was critiquing his maneuvers, the pilot decided to fly his "free" sequence, a series of 25 maneuvers. After a short rest, the pilot began these maneuvers which he had flown many times. He had completed maneuver number 19, two and one-half rolls from inverted to upright, which was preceded by an outside three-quarter loop. After completing the roll maneuver, the aircraft flew straight and level for a short time. The aircraft then started a short climb, then the nose dropped below the horizon and the aircraft departed the practice box in a 45° nosedown attitude. The aircraft impacted in a heavily wooded area and burned. The pilot did not survive.

During the entire practice flight, the pilot had been in radio contact with the observer on the ground. When the pilot appeared to break off his series of maneuvers and depart the practice box, he was asked his reasons for this but he did not reply. The investigation has not revealed any preimpact aircraft malfunctions; postmortem examination of the pilot disclosed no diseases.

The effect of aerobatic G forces, i.e., Gz or vertical axis forces, on human physiology is well stated in a Federal Aviation Administration (FAA) publication entitled "G Effects on the Pilot During Aerobatics," FAA-AM-72-28, July 1972, by Stanley R. Mohler, M.D. This report provides information relative to the nature of aerobatic G forces; human physiology in relation to G forces; human tolerances and exposure limits to G forces; and methods to increase tolerance to aerobatic G forces. Data in the report indicates that aerobatic pilots can expect to experience a variety of symptoms resulting from different levels of positive and negative G's over a wide

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range of exposure times. Symptoms from gray-out to unconsciousness can occur during a positive G maneuver (referred to as an "inside" maneuver). A negative G maneuver (referred to as an "outside" maneuver) can result in discomfort, headaches, or unconsciousness. For the aerobatic pilot, the most significant finding in the report is the fact that loss of consciousness most likely will occur when high negative G maneuvers are followed by high positive G maneuvers such as a vertical "8" (i.e., an outside upper loop followed by an inside lower loop). Unconsciousness occurs due to the rapid swing from negative to positive G forces resulting in decreased blood circulation to the brain at G force levels of -3.5 to -4, and +4 to +4.5.

G forces sustained in aerobatic demonstrations and competitions today are more likely to be near -6.5 and +8 G's for some aerobatic aircraft. The pilot's last two maneuvers, mentioned previously, took him from a high negative G in the pullout from an outside loop into a sustained high positive G environment of two and one-half rolls. It is the Safety Board's opinion that, in the light of the evidence presented, physiological incapacitation of the pilot can not be ruled out.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Include in a future revision of the Airman Information Manual (AIM), Basic Flight Information and ATC Procedures, Chapter 7, Medical Facts for Pilots, a brief discussion of the physiology of aerobatic G forces as explained in FAA-AM-72-28. (Class II, Priority Action) (A-81-48)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

James B. King

By: James B. King
Chairman

U.S. Department
of Transportation

**Federal Aviation
Administration**

August 6, 1981

The Honorable James B. King
Chairman, National Transportation
  Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-49 through A-81-53 issued by the Board on May 7, 1981. These recommendations resulted from the Board's investigation of the Beech Baron/Travel Air series of airplanes, involving a propensity for entering flat spins under conditions of high asymmetric power and low speed.

<u>FAA General Remarks</u>: The text of the Board's recommendations states that there were eight fatal accidents between March 1978 and March 1980 involving Beech aircraft, where flat spins occurred under conditions of high asymmetric power and low speed. A review of the Federal Aviation Administration (FAA) records for the period April 1976 to January 1979 indicates that no spin accidents occurred in Baron airplanes which could be attributed to the practice of V_{mc} maneuvers. From January 1979 to the present, two training accidents have occurred which could possibly be attributed to the practice of V_{mc} maneuvers. In one instance, the training was being conducted in an airplane equipped with a single throw-over yoke, not in accordance with applicable Federal Aviation Regulations (FAR) requirements. In the other case, it appears highly probable that engine cut-offs were introduced at speeds below the published V_{mc} and at low altitude in order to test student reactions.

In 1976, in response to earlier NTSB safety recommendations, Beech Aircraft Corporation and the FAA participated jointly in a test program to revalidate findings of compliance with Civil Air Regulation (CAR) 3.123. The results were satisfactory and it was concluded that, as required by the applicable regulations, no undue spinning tendency existed. The introduction of the concept of V_{sse} (intentional one engine inoperative speed) in 1976 provided an additional safety margin above V_{mc} and V_s to minimize the potential hazard associated with V_{mc} and single-engine stall demonstrations and training. It should be noted that FAA policy has historically advised that single-engine stalls will not be demonstrated on multi-engine flight tests, and should not be practiced in high performance airplanes by other than qualified engineering test pilots. Additionally, V_{mc} should not be demonstrated when the V_{mc} is known or discovered to be close to

stalling speed. These established training and flight test limitations, coupled with the extensive safety information concerning one-engine inoperative flight procedures included in the Beech Aircraft Flight Manuals and Pilot Operating Handbooks, are still considered adequate to ensure safe operation of the airplane in all authorized flight regimes. Additional information concerning stalls and single-engine operation of light twin-engine aircraft is contained in Advisory Circular (AC) 61-54, Flight Test Guide - Private Pilot Airplane, and in AC 61-21A, Flight Training Handbook. The FAA does not consider it advisable to dictate design of, or impose limitations on, a particular airplane, whereby complete safety would be assured despite a flagrant disregard of regulations or extreme cases of poor airmanship.

A-81-49. Require that a placard be installed in all Beech Baron/Travel Air aircraft warning of the dangers of and prohibiting intentional single-engine stalls.

FAA Comment. We agree that the practice of demonstrating single-engine stalls with high asymmetric power in the light twin-engine airplane training environment is potentially a high risk maneuver. Additionally, the demonstration of actual V_{mc} speeds below the published V_{mc} should be avoided except by qualified engineering test pilots in a test environment.

The problems which relate to the conduct of single-engine stalls are common to all high-performance light twin-engine airplanes and differ only in a matter of degree, so that the post-stall characteristics and V_{mc} handling qualities of a particular airplane are elements inseparable from basic knowledge and training requirements. The same problems exist in transport category airplanes where accepted training procedures are considered adequate to avoid the hazards associated with single-engine stalls or V_{mc} characteristics. We believe the level of basic knowledge is adequate, and the training appropriate, and therefore find that a warning is unnecessary. Accordingly, we do not believe it is appropriate to prohibit selectively intentional single-engine stalls in the Beech Baron/Travel Air series airplane, and the FAA considers action completed on Safety Recommendation A-81-49.

A-81-50. Amend 14 CFR 23.205, "Critical Engine Inoperative Stalls," to make the test requirements more rigorous with regard to the potential detection of an airplane's propensity to display any undue spinning tendency.

FAA Comment. The FAA contends that the formulation of requirements more rigorous than those set forth in FAR Part 23.205, such as requirements for higher thrust on the operative engine, additional airplane configuration testing, altitude testing, etc., could lead to unrealistic and impractical requirements.

The provisions of Part 23.205 were revised by Amendment 3-7, requiring one-engine inoperative stall characteristics that preclude unintentional spin entry. This requirement was found to be impractical, and the substance of the prior effective rule was reinstituted by Amendment 23-3, resulting in essentially the same provisions as Part 23.205, which is currently effective.

In view of the foregoing, we do not believe it is appropriate to establish more rigorous one-engine inoperative stall requirements, nor do we believe it productive to expand the flight test regime for testing of one-engine inoperative stall/spin characteristics at this time. Moreover, we doubt that the more rigorous stall/spin criteria would help to reduce stall/spin accidents. Such testing might only induce pilots to attempt spinning airplanes, with a resultant increase in stall/spin accidents, even though operating limitations prohibit intentional spins. The entire philosphy of the type certification and training requirements is based on the avoidance of spins in an operational environmment. We believe this philosophy of avoidance is the more reasonable and fruitful approach toward resolving this problem. We will continue to follow stall/spin research in progress, and, if developments indicate changes to the regulations are required, we will take appropriate action. We do not plan to pursue this issue further, and, accordingly, the FAA considers action completed on Safety Recommendation A-81-50.

A-81-51. Require Beech Aircraft Corporation to disseminate information relating to Beech Baron/Travel Air single-engine stall speeds, including graphical or other information showing the operational conditions and limits wherein flight at the published value of Vmc is not possible.

FAA Comment. This problem appears to be associated with conditions where flight demonstrations involve speeds well below the published V_{mc}. The FAA believes that any attempt to provide the information suggested in this recommendation could mislead airplane operators and, in fact, be counter-productive. We are concerned that it may appear to condone training activities at speeds which have not been investigated during the certification process.

Regulations require that stalls be investigated with one engine inoperative under specified conditions: critical engine inoperative, flaps and landing gear retracted, and remaining engine(s) operating at 75 percent maximum continuous power. Satisfactory characteristics in the specified configuration do not necessarily coincide with those in the configuration required for demonstration of V_{mc}. This confusion, in itself, may negate any benefit resulting from publication of the recommended information. Additionally, we are concerned that such information could be too complicated to achieve its intended purpose. Except for a few extreme conditions, there are very few situations where the published V_{mc} cannot be achieved prior to reaching stall, with power settings within the normal operating envelope.

In consideration of the foregoing, no further action on Safety Recommendation A-81-51 will be pursued.

A-81-52. Convene a special certification review team to explore and evaluate the relative margins of safety of the Beech Baron in low-speed, high-power, single-engine operations for all conditions which may be realistically anticipated in a multiengine, pilot-training environment.

FAA Comment. The use of a Special Certification Review team to explore and evaluate the relative safety margin of the Beech Baron airplane, specifically, is not considered appropriate. The "relative safety margin" must be determined by comparison to some standard, norm, or specification. If the specification used is the FAA regulation that pertains to the certification aspects

of the problem, then compliance has been satisfactorily shown to the extent that the airplane does not "possess any undue spinning tendency" when operated within the established limitations and approved envelope. In reference to conditions of flight that may be reasonably anticipated in a multi-engine, pilot-training environment, we find that existing regulations, policies, and standard operating procedures are adequate to provide an appropriate level of safety, provided these standards are adhered to.

If the "relative safety margin" is intended to mean a comparison between selected light twin-engine airplanes and their individual degree of freedom from undue spinning tendency, then this involves the same questions discussed in our response to A-81-49, -50, and -51. Each airplane has its own unique flight characteristics and must be judged against a minimum standard established by regulation. However, only insofar as reestablishing a new minimum standard would a direct comparison of two or more airplanes be productive. Accordingly, we do not intend to convene a special certification review team and the FAA considers action completed on Safety Recommendation A-81-52.

A-81-53. Require that all Beech Baron/Travel Air aircraft be retrofitted with aerodynamic air flow kits or components designed to alleviate their hazardous single-engine stall characteristics. Relative to the retrofit, Beech Aircraft's stall research program should provide for prompt development of appropriate hardware, rigging of controls, and/or other necessary modifications.

FAA Comment. The NTSB is aware of the stall research program which studies the potential for moderating the inherent roll rates of conventional light twin-engine aircraft in single-engine, fully stalled conditions. This is a relatively long-term project, and the FAA's Central Region is monitoring Beech Aircraft's progress in this endeavor. Additionally, we will encourage Beech Aircraft to proceed without delay in the development of any hardware to modify their airplanes, resulting in improved single-engine stall characteristics.

When such hardware becomes available, the FAA will proceed in accordance with the dictates of service history to require such retrofit as deemed necessary and appropriate. We have no information at this time on which to base a mandatory retrofit and, therefore, no immediate action is contemplated on Safety Recommendation A-81-53.

Sincerely,

J. Lynn Helms
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 7, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-49 through -53

For the past several years, the Beech Baron/Travel Air series of airplanes have demonstrated a propensity for entering flat spins under conditions of high asymmetric power and low speed. Between March 1978 and March 1980, there were eight fatal accidents of this type. The accident at Cumming, Georgia, on February 19, 1980, involving a Beech 95-B55 typifies the operational circumstances of most of these accidents. The instructional flight was the second in a multiengine course involving single-engine operation and the demonstration of minimum control speed. The pilot trainee, the only survivor, recalls attempting to move his body as far forward as possible during the spin in order to bring the nose of the airplane down. Witnesses saw the aircraft spinning with the tail lower than the nose.

The involvement of Beech Baron/Travel Air airplanes in flat spin accidents is not a new problem nor one that has just recently emerged. The Safety Board has previously sent five safety recommendations (A-75-64 and A-76-97 through -100) to the Federal Aviation Administration (FAA) regarding this subject. The Safety Board believes that had the FAA complied with these recommendations some of these accidents may have been prevented.

Based on the circumstances of these accidents, the Safety Board concludes that training for a potential emergency in Beech Baron/Travel Air airplanes, such as an engine-out condition, may be more hazardous than the emergency itself. For some conditions of airplane gross weight and altitude, the single-engine stall speeds of the aircraft are greater than the single-engine minimum control speeds (Vmc). Consequently, when pilots, including instructor pilots, attempt to demonstrate Vmc or loss of directional control, they may unexpectedly encounter a single-engine stall. At high asymmetric power, the stall in these airplanes is abrupt and is accompanied by rapid rolling to an inverted or near inverted position, followed by entry into a flat spin.

While one could take the position that pilots should be more careful and recover the airplane before this loss-of-control situation develops, the Safety Board believes that such a position is tenuous. The Beech Baron flat-spin accident record, coupled with the fact that some of the instructor pilots involved were highly experienced in Beech aircraft, tends to confirm that the situation demands above-average pilot skill and alertness.

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The single-engine stall characteristics of these aircraft, under the above circumstances, create an undue tendency to spin that is not measured or tested under 14 CFR 23.205, "Critical Engine Inoperative Stalls." Tests under this part, for example, involve: (1) only 75 percent maximum continuous power, or less, rather than takeoff or maximum available power used in Vmc demonstrations; (2) a feathered propeller rather than a windmilling propeller; and (3) minimal sideslip. This regulation, when scrutinized, is relatively weak insofar as detection of undue spinning tendencies is concerned.

In any event, the airplane is not safely controllable or maneuverable under the high asymmetric power conditions and other adverse factors that are routinely related to the demonstration of Vmc. With high asymmetric power, rolloff at the stall constitutes an unsafe feature that is not compatible with intended usage in a multiengine training environment.

The U.S. Army in a 1974 report, "T-42A Single-Engine Performance and Stall Investigation," described the single-engine (asymmetric) power on stalls of the Beech Model B55B as violent and potentially catastrophic. The following excerpts from that report detail these characteristics:

> The stall characteristics with single-engine power on are considerably more severe than those for symmetrical power conditions. Single-engine power-on stall is characterized by a rapid roll toward the inoperative (dead) engine. If not immediately arrested, this roll progresses rapidly into a wing-over or split-S entry into an upright spin. Vigorous and immediate recovery action is required.
>
> <u>Instantaneous Recovery Action</u>. When recovery was initiated immediately at stall, a rapid forward movement of the elevator control normally arrested the roll rate and regained control of the aircraft. Full rudder control opposite to the direction of roll was normally already applied since stall occurs below Vmc. If full rudder had not been previously initiated, it was applied concurrently with the forward elevator control. If these combined actions did not arrest the roll rate, power was reduced on the operative (good) engine. Recovery was normally from a large bank angle (approaching 90 degrees), nose-down attitude which results in a steep, diving pullout. Rapidly increasing airspeed during the pullout exceeded the airframe limits for the landing gear and flaps requiring these items to be retracted. Extreme care was necessary during the pullout to avoid a high-speed, accelerated stall.
>
> <u>Delay Recovery Action (1 second delay)</u>. When any delay in recovery action was allowed at full stall, the roll rate increased rapidly. Virtually full forward movement of the elevator control and complete power reduction on the operative engine was required for recovery. Recovery following a slight delay (1/4 to 1/2 second) was from a split-S or complete wing-over maneuver. With slightly longer delays (approaching 1 second) the wing-over progresses immediately into an upright spin. The considerations discussed above concerning rapidly building airspeed and avoidance of a high-speed, accelerated stall likewise apply for the delayed recovery.

In 1976, the operational concept of a safe single-engine speed (Vsse) was introduced to alleviate the adverse dynamic effects of an intentional engine-out at or close to either Vmc or the single-engine stall speed. Subsequently, the FAA disseminated information regarding Vsse and proper engine inoperative procedures through flight training clinics, pilot safety seminars, and flight instructor refresher courses. Any beneficial effects, however, were short-lived as evidenced by the increasing number of Beech Baron flat-spin accidents. The Safety Board believes that, in addition to pilot education, positive effort is needed to resolve any existing undue spinning tendencies during critical engine-inoperative stalls of this as well as similar aircraft which may be certificated in the future.

In October 1980, the Beech Aircraft Corporation initiated a stall research program to study the potential for moderating the inherent roll rates of conventional light twin-engine aircraft in single-engine, fully stalled conditions. Beech anticipates that this two-phase wind tunnel/flight test program will take at least 18 months to complete. While Beech's stall research program is commendable, the Safety Board does not believe that it is adequately expedient in resolving the involvement of Beech airplanes in flat-spin accidents.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require that a placard be installed in all Beech Baron/Travel Air aircraft warning of the dangers of and prohibiting intentional single-engine stalls. (Class II, Priority Action) (A-81-49)
>
> Amend 14 CFR 23.205, "Critical Engine Inoperative Stalls," to make the test requirements more rigorous with regard to the potential detection of an airplane's propensity to display any undue spinning tendency. (Class II, Priority Action) (A-81-50)
>
> Require Beech Aircraft Corporation to disseminate information relating to Beech Baron/Travel Air single-engine stall speeds, including graphical or other information showing the operational conditions and limits wherein flight at the published value of Vmc is not possible. (Class II, Priority Action) (A-81-51)
>
> Convene a special certification review team to explore and evaluate the relative margins of safety of the Beech Baron in low-speed, high-power, single-engine operations for all conditions which may be realistically anticipated in a multiengine, pilot-training environment. (Class II, Priority Action) (A-81-52)
>
> Require that all Beech Baron/Travel Air aircraft be retrofitted with aerodynamic air flow kits or components designed to alleviate their hazardous single-engine stall characteristics. Relative to the retrofit, Beech Aircraft's stall research program should provide for prompt development of appropriate hardware, rigging of controls, and/or other necessary modifications. (Class II, Priority Action) (A-81-53)

In addition, the National Transportation Safety Board reiterates our previous recommendation that the Federal Aviation Administration:

Issue an Advisory Circular dealing solely with simulated and actual engine-out emergencies in typical high performance, multiengine general aviation airplanes. (Class II - Priority Action) (A-75-64)

This Circular, aside from providing general operational guidelines and technical information, should supplement present FAA Advisory Circular 61-67, "Hazards Associated With Spins in Airplanes Prohibited From Intentional Spinning," by placing special emphasis on the potentially catastrophic and often irreversible situations which may develop, such as the flat spin, if a loss of control is allowed to occur. This information should be mailed directly to all pilots holding multiengine class ratings, distributed to fixed base operators and flight schools, and disseminated among the various flight instructor clinics and safety seminars held throughout the year. In addition, the FAA's Accident Prevention Staff should, where feasible, discuss operational details with recipients to assure that the objectives of the Circular are thoroughly understood.

KING, Chairman, DRIVER, Vice Chairman, McADAMS and GOLDMAN, Members, concurred in these recommendations. BURSLEY, Member, did not participate.

James B King

By: James B. King
Chairman

Office of the Chairman

National Transportation Safety Board

Washington, D.C. 20594
August 13, 1981

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Thank you for your letter dated July 27, 1981, responding to National Transportation Safety Board Safety Recommendations A-81-54 through -56 issued May 8, 1981. These recommendations pertain to the upward trend in Service Difficulty Reports concerning the Brackett engine air inlet systems.

We are pleased to note that the Federal Aviation Administration issued Brackett Aircraft Company, Inc., Airworthiness Directive (AD) 81-15-03 on July 1, 1981, with an effective date of July 20, 1981, to fulfill the intent of the three recommendations. Safety Recommendations A-81-54 and -55 are classified in a "Closed--Acceptable Action" status and A-81-56 in a "Closed--Acceptable Alternate Action" status.

We thank you for your prompt action.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF THE ADMINISTRATOR

July 27, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-54 through A-81-56 issued by the Board on May 8, 1981. These recommendations resulted from the Board's investigation of an upward trend in Service Difficulty Reports concerning the Brackett engine air inlet systems.

A-81-54. Revise Airworthiness Directive 78-25-05, Brackett Specialties Company, to include all aircraft listed in Brackett Aircraft Company, Inc., Service Bulletin Nos. 3 and 4.

A-81-55. Issue an Airworthiness Directive which would require compliance with Brackett Aircraft Company, Inc., Service Bulletin No. 5, dated July 28, 1980.

FAA Comment. The Federal Aviation Administration (FAA) concurs in these two recommendations and we have issued Airworthiness Directive (AD) 81-15-03 which supersedes AD 78-25-05, Amendment 39-3365. The issue date of AD 81-15-03 was July 1, 1981, with an effective date of July 20, 1981. A copy of the AD is enclosed.

As a matter of information, please note that Brackett Aircraft Company, Inc., Service Bulletin No. 4 is no longer in existence, having been superseded by Service Bulletin No. 6. The FAA considers action completed on Safety Recommendations A-81-54 and 55.

A-81-56. Issue a General Aviation Airworthiness Alert to inform all users of Brackett Aircraft Company, Inc., air filter assemblies of the requirements of AD 78-25-05, Brackett Specialities Company, as amended, and of the need to comply with Brackett Aircraft Company, Inc., Service Bulletin Nos. 3, 4, and 5.

FAA Comment. The FAA does not concur in this recommendation. A General Aviation Airworthiness Alert is generally issued for those service difficulties which have not been the subject of AD's. Since, in this case, an AD has already been issued, it is not necessary to issue another notification of the same information provided by the AD. The FAA considers action completed on Safety Recommendation A-81-56.

Sincerely,

J. Lynn Helms
Administrator

Enclosure

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 8, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20590

SAFETY RECOMMENDATION(S)

A-81-54 through -56

The Flight Standards National Field Office, AFO-500, Service Difficulty Automatic Data Processing System Bank has provided statistical information which indicates that there is an upward trend in Service Difficulty Reports concerning the Brackett engine air inlet systems.

In October 1980, engine air inlet system problems in the Cessna 177 alerted the Federal Aviation Administration's Service Difficulty Automatic Data Processing System. During the 2-year period from September 1, 1978, through September 18, 1980, there were 20 reports of such problems. An upward trend in the rate of reporting was noted when nine reports were processed between April 16 and September 5, 1980. Of the nine reports one report cited a defective aluminum retainer screen, and five reports stated that the engine air filter gaskets failed, separated, and lodged in the carburetor/injector air passages which reduced air flow and available engine power. These failures resulted in two accidents and three unscheduled landings. Both accidents and the two unscheduled landings occurred on aircraft equipped with the Brackett air filter.

A search of FAA Service Difficulty Reports conducted in January 1981 indicated that 16 incidents of Brackett air filter system failure were reported between May 3, 1979, and December 5, 1980. These incidents involved four Cessna 177's as well as Beech, Piper, and other Cessna aircraft. Five reports cited failures of the gasket assembly, 10 reports cited failures of the screen assembly, and one report cited a loose seal.

A survey of NTSB briefs of accidents from 1965 through 1979 revealed 14 accidents in which foreign material affected normal operation of the carburetor/injector system. Cessna aircraft were involved in 7 of the 14 accidents.

The Brackett Aircraft Company, Inc., formally Brackett Aircraft Specialties, is a source supplier and holder of an FAA type certificate for its engine air filter assemblies. On December 29, 1977, the FAA issued Supplemental Type Certificate (STC) No. SA71GL for a design change for the company's engine air filter assemblies. The STC affected Cessna models 177, 180, 210, and 310 aircraft, Grumman American model AA-1 aircrafts and Piper PA-20 aircraft. The company also issued two Service Bulletins, Nos. 1 and 2, both of which stated that the aluminum retainer screen should be replaced with a steel screen for the aircraft mentioned in the STC. However, both bulletins excluded the Cessna 177 model aircraft.

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As a result of the reports of the defective aluminum retainer screen in the air filter assembly, the FAA issued Airworthiness Directive (AD) 78-25-05, effective December 15, 1978. The AD established an inspection requirement of the aluminum retainer screens for failed areas and required replacement of the aluminum retainer screen with a steel screen if failed areas were noted during the inspection. The AD modification was in accordance with STC SA71GL. The AD applied to numerous Cessna aircraft models but did not include the Cessna 177 model.

After AD 78-25-05 became effective, the Brackett Aircraft Company, Inc., issued Service Bulletin No. 3, which superseded Service Bulletin No. 2 and also stated that the aluminum retainer screen should be replaced with a steel screen. Service Bulletin No. 3 also applied to various aircraft models, including some Cessna aircraft; however, the Cessna model 177 aircraft again was excluded. On July 15, 1980, Brackett issued Service Bulletin No. 4 which applied to the Cessna 177, or any aircraft equipped with the Brackett air filter assembly, and required that the aluminum retainer screen be replaced with a steel screen.

The Brackett Aircraft Company, Inc., aware of the filter gasket defects in their engine air filter assemblies, on July 28, 1980, issued Service Bulletin No. 5, which stated that the gaskets had become loose because of the effects of oils, grease, fuel, and loose and improper fitting fasteners that held the filter in place. The company recommended that gasket retainer strips be installed to prevent the gasket from entering the engine induction system in the event the gasket should become loose. Service Bulletin No. 5 included the model number of the air filter used on the Cessna 177 aircraft. The company also has made kits available to upgrade existing filters.

The Brackett Aircraft Company, Inc., informed the Safety Board that its gasket retainer strip will provide a tight fitting filter frame. A tightly fitted filter will squeeze the gasket, prevent deterioration, and prevent greases and solvents from penetrating the bond. A loose fitting filter will cause the gasket to vibrate and allow grease and solvent to penetrate the bond. The president of the Brackett Aircraft Company, Inc., stated that the Cessna 177 aircraft is vulnerable to filter frame vibration.

The Brackett Aircraft Company has advised the Safety Board that they could not supply a sudden request for a large number of kits to upgrade existing installed filters. Both the Brackett Aircraft Company Service Bulletin No. 3 and AD 78-25-05, Brackett Aircraft Specialities, Inc., note that an inspection of the screen gasket assembly should be performed within 25 hours of receipt of the Service Bulletin or Airworthiness Directive. Additional inspections were to be made at 100-hour intervals until the screen assembly was replaced. The airworthiness directive required that the aluminum screen gasket assembly be replaced with a steel assembly within 525 hours after receipt of the AD. The Safety Board believes that AD 78-25-05 should apply to the Cessna 177.

The Safety Board contacted the Cessna Aircraft Company for information on the use of Brackett air filter assemblies on its aircraft. Its designated engineering representative, who also was project engineer on the Cessna 177, stated that the Brackett Company never was a supplier of engine air inlet system for their company and was not an approved vendor for Cessna. However, owners/operators can and do purchase and install Brackett air filters on their aircraft. Even though the Cessna 177 has not been manufactured since 1978, the FAA Registry Section reported that there are 3,166 registered Cessna 177's in the United States.

The Safety Board became aware on February 13, 1981, that the FAA Western Region Aircraft Modification Section, Engineering and Manufacturing Branch (AWE-211), is conducting a special study on the Brackett engine air inlet system. The Safety Board also has been informed that the FAA is considering airworthiness action on this subject.

Because of the upward trend in Brackett air filter defect reports since the issuance of AD 78-25-06 and the two Brackett Aircraft Company, Inc., Service Bulletins, the Safety Board believes that additional corrective measures should be taken to prevent further accidents resulting from air filter failures.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Revise Airworthiness Directive 78-25-05, Brackett Specialties Company, to include all aircraft listed in Brackett Aircraft Company, Inc., Service Bulletin Nos. 3 and 4. (Class II, Priority Action) (A-81-54)
>
> Issue an Airworthiness Directive which would require compliance with Brackett Aircraft Company, Inc., Service Bulletin No. 5, dated July 28, 1980. (Class II, Priority Action) (A-81-55)
>
> Issue a General Aviation Airworthiness Alert to inform all users of Brackett Aircraft Company, Inc., air filter assemblies of the requirements of AD 78-25-05, Brackett Specialities Company, as amended, and of the need to comply with Brackett Aircraft Company, Inc., Service Bulletin Nos. 3, 4, and 5. (Class II, Priority Action) (A-81-56)

KING, Chairman, DRIVER, Vice Chairman, McADAMS and GOLDMAN, Members, concurred in these recommendations. BURSLEY, Member, did not participate.

James B. King

By: James B. King
Chairman

US Department
of Transportation

**Federal Aviation
Administration**

August 3, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-57 and A-81-58 issued by the Board on May 13, 1981. These recommendations resulted from the Board's investigation of solid-state technology as it applied to data compression in digital flight data recorders (DFDR).

A-81-57. Amend 14 CFR 121.343 to allow use of digital flight data recorders (DFDR) which employ some form of data compression if the manufacturer can demonstrate during aircraft certification that upon recorder readout the required parameters can be reconstructed to the accuracy and ranges specified in Part 121, appendix B, and that the recorded data are adequate for accident investigation purposes.

A-81-58. Amend column 4, "Recording Interval Maximum (Seconds)," appendix B, 14 CFR 121 so that it applies to: (1) the recording interval of continuously recording machines, such as the currently used magnetic tape digital flight data recorder and (2) the data sampling intervals of DFDR's employing data compression.

FAA Comment. Amendments to 14 CFR 121.343 and to appendix B of 14 CFR 121 are not necessary to permit the use of DFDR's which employ some form of data compression. Approval can be granted under existing regulations if an applicant can demonstrate during aircraft certification that, upon recorder readout, the required parameters can be reconstructed to the accuracy and ranges specified in appendix B of 14 CFR 121. In addition, it must be demonstrated that the recorded data are adequate for accident investigative purposes.

The Federal Aviation Administration intends to take no further action relative to Safety Recommendations A-81-57 and A-81-58.

Sincerely,

J. Lynn Helms
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 13, 1981

Forwarded to:

Mr. J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-57 and -58

Solid-state nonvolatile memories are now available as viable candidates for use as the recording medium in flight recorders. Solid-state is a superb technology for this application since it will result in recorders with no moving parts that are virtually maintenance free.

Solid-state is coming into its own in the computer memory field in general. Available now is a bubble memory board which provides 1.3 million bits of nonvolatile storage. In the aircraft data recording field, several manufacturers have built prototype solid-state crash recorders for United States military applications.

Appendix B, 14 CFR 121 requires that sampled data for a given aircraft parameter be recorded at a given maximum interval (usually one second, depending on the parameter). This technique works well for magnetic tape digital flight data recorders (DFDR) which employ a continuously moving recording medium. However, solid-state DFDR's have no moving medium, and data are stored in physical locations in circuit chips. Implementation of the fixed recording interval specified in the current regulation is not efficient for use with the solid-state recorder. Solid-state memories are most efficient when used to store compressed data.

Currently, several methods are available to achieve data compression, and any of these could well be a viable means of recording accident data. Such methods should be permitted if the manufacturer can prove during certification that his technique allows precise and accurate reconstruction of the required parameters over the specified ranges and that the recorded data are adequate for accident investigation purposes.

Accordingly, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Amend 14 CFR 121.343 to allow use of digital flight data recorders (DFDR) which employ some form of data compression if the manufacturer can demonstrate during aircraft certification that upon recorder readout the required parameters can be reconstructed to the accuracy and ranges specified in Part 121, appendix B, and that the recorded data are adequate for accident investigation purposes. (Class II, Priority Action) (A-81-57).

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Amend column 4, "Recording Interval Maximum (Seconds)," appendix B, 14 CFR 121 so that it applies to: (1) the recording interval of continuously recording machines, such as the currently used magnetic tape digital flight data recorder and (2) the data sampling intervals of DFDR's employing data compression. (Class II, Priority Action) (A-81-58)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594
August 13, 1981

Office of the Chairman

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Thank you for your letter dated July 22, 1981, responding to National Transportation Safety Board Safety Recommendations A-81-59 and -60 issued May [illegible], 1981. These recommendations stemmed from our investigation of a Bell 206L-1 helicopter accident which occurred on March 25, 1981, in the Gulf of Mexico. The accident resulted from an engine flameout caused by the fracture of the splined adapter in the Detroit Diesel Allison 250-C28 engine. The recommendations pertain to the removal of the splined adapter PN 6899243 and for the Federal Aviation Administration (FAA) to review and evaluate the manufacturing process and quality assurance procedures.

The Safety Board is pleased to note that all affected splined adapters have been removed from service and that the FAA is in the process of reviewing and evaluating the manufacturing process and quality assurance procedures. Safety Recommendation A-81-59 is classified in a "Closed--Acceptable Alternate Action" status and A-81-60 is maintained in an "Open--Acceptable Action" status pending the FAA's further response.

Sincerely yours,

James B. King
for Chairman

US Department
of Transportation

**Federal Aviation
Administration**

Office of the Administrator

July 22, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-59 and A-81-60 issued by the Board on May 22, 1981. These recommendations resulted from the Board's investigation of the crash of a Bell 206L-1 helicopter, N-1077N, en route from an offshore oil rig on March 25, 1981. The accident was the result of an engine flameout, caused by the fracture of the splined adapter in the Detroit Diesel Allison 250-C28 engine, apparently due to fatigue.

A-81-59. Issue an Airworthiness Directive to require that those Allison 250-C28 and -C30 engines identified by the manufacturer as having the PN 6899243, Revision A, splined adapters installed be removed from service.

FAA Comment. The Federal Aviation Administration (FAA) has been fully cognizant of the situation addressed in this recommendation, and our Engineering and Manufacturing organization has worked closely with Detroit Diesel Allison toward resolution of this problem.

By April 29, 1981, well before issuance of Safety Recommendation A-81-59, all 47 engines having the affected splined adapters were removed from service. The splined adapters were removed from these engines and returned to the factory for destruction by June 19, 1981. The engines will be returned to service when airworthy splined adapters become available. Accordingly, FAA's prompt action precludes the necessity for issuance of an airworthiness directive, and we consider action on this recommendation completed.

A-81-60. Review and evaluate the manufacturing processes and quality assurance procedures for these splined adapters to ensure product integrity and safety.

FAA Comment. FAA's Engineering and Manufacturing organization is in the process of reviewing and evaluating the manufacturing process and quality assurance procedures. The Board will be informed of our findings.

Sincerely,

J. Lynn Helms
Administrator

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 22, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-81-59 and -60

On March 25, 1981, a Bell 206L-1 helicopter, N 1077N, was en route from an offshore oil rig to shore when the pilot reported that the engine flamed out. The aircraft was successfully autorotated to the water from a cruising altitude of 500 feet. The pilot and five passengers escaped injury even though the helicopter rolled over during water entry.

The wreckage was subsequently recovered. Disassembly of the engine (Detroit Diesel Allison 250-C28) revealed that the splined adapter, part number 6899243, Revision A, had fractured. This adapter connects the gas generator turbine shaft to the compressor impeller. Preliminary metallurgical examination of the fractured surface indicated fatigue. Total service time on the adapter was 60.6 hours.

The manufacturer reported that the failed adapter was 1 of 47 recently produced and put into service as a product improvement item. The manufacturer also indicated that the adapters have serial numbers by which the adapters could be located through the manufacturer's distributors. The Safety Board is aware that Allison has recently issued a bulletin to operators recommending that engines with these adapters be removed from service. However, we are concerned that some operators may not remove the engines from service because compliance with the bulletin is discretionary.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Airworthiness Directive to require that those Allison 250-C28 and -C30 engines identified by the manufacturer as having the PN 6899243, Revision A, splined adapters installed be removed from service. (Class II, Priority Action) (A-81-59)

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Review and evaluate the manufacturing processes and quality assurance procedures for these splined adapters to ensure product integrity and safety. (Class II, Priority Action) (A-81-60)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

James B. King

By: James B. King
Chairman

US Department
of Transportation
Federal Aviation
Administration

Office of the Administrator

AUG 13 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-61 and A-81-62 issued by the Board on June 3, 1981. These recommendations resulted from the Board's investigation of the crash of a Continental Airlines/Air Micronesia, Inc., Boeing 727-92C at Yap Airport, Yap, Western Caroline Islands, on November 21, 1980. This accident revealed problems associated with emergency procedures for operation of the ventral airstair door on selected Boeing 727 aircraft.

A-81-61. Require that air carriers operating applicable Boeing 727 aircraft include emergency procedures for operation of the ventral airstair door in their training programs for cabin crews.

FAA Comment. FAR Parts 121.417(b)(2)(iv) and 121.417(c)(1) require that each crewmember be trained on, and actually operate, each type of emergency exit in the normal and emergency modes with emphasis on operation of the exits under adverse conditions. Thus, if a certificate holder utilizes a B-727 with a required ventral exit, the crewmembers must be trained on that exit.

By Federal Aviation Administration (FAA) letter dated April 16, 1980, all Regional Flight Standards Division Chiefs were reminded of the existence of ventral exits on certain B-727 aircraft. We have emphasized that the exit is a required emergency exit on selected B-727 aircraft, including the B-727-100 with more than 119 passenger seats.

Since the FAR already require training on each type of emergency exit, we believe that these additional measures are fully responsive to Safety Recommendation A-81-61. Accordingly, the FAA considers action completed on this recommendation.

A-81-62. Issue an Airworthiness Directive on applicable Boeing 727 aircraft to require that the location of the emergency operating control for the ventral airstair door be readily apparent regardless of the position of the access door for the normal system control.

FAA Comment. As a result of this safety recommendation, the FAA has reassessed the locating features of the ventral stair emergency extension system. The ventral stairway can be lowered by use of either the normal or the emergency control handle. These controls are adjacent to each other on the right side of the ventral stairway. The normal control handle is located behind an access door hinged on the aft side and is placarded "Stair Control." The emergency control handle is aft of the normal handle compartment and is behind a gray cover with caption in red, "Emergency Use Only, Air Stair Extension," and "Pull To Remove Cover." All other panels in the ventral stairway area are white. The emergency airstair extension control handle cover is readily visible to anyone entering the ventral stairway area when the normal handle access door is closed or opened to the 90 degree position. When opened 180 degrees, approximately 2 1/2 inches of the emergency handle cover is exposed.

Apparently, in the Continental Airlines B-727 accident at Yap Airport, the flight attendant either failed to perform as she was trained to do, or did not receive the crewmember training as required by FAR Parts 121.417(b)(2)(iv) and 121.417(c)(1). Being familiar with the normal extension system, but unaware of the existence of the emergency system, she reportedly went directly to the normal handle access door. When the airstair did not lower, the attendant directed the evacuation through another exit. Our evaluation of the locating features of the B-727 ventral stair emergency actuation systems confirms compliance with Civil Air Regulations 4b.362(f). In any event, we consider this a unique occurrence and find it highly unlikely that an attendant who has been trained in the use of the emergency system, would overlook the emergency handle cover when entering the ventral stairway.

Accordingly, we consider the system acceptable and it is our conclusion that insufficient justification exists to issue an Airworthiness Directive requiring a design change or revised placarding. The FAA, therefore, considers action completed on Safety Recommendation A-81-62.

Sincerely,

J. Lynn Helms
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: June 3, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-81-61 and -62

On November 21, 1980, a Continental Airlines/Air Micronesia, Inc., Boeing 727-92C, N18479, landed short of the runway at Yap Airport, Yap, Western Caroline Islands. The right main landing gear separated at touchdown. Extensive damage to the right wing was sustained when the aircraft slid along the ground resulting in fuel spillage and fire which engulfed the right wing and most of the right side of the fuselage as the aircraft skidded to a stop. The galley door and the two overwing emergency window exits on the right side of the aircraft were not used because of the fire. All 73 occupants, except two crewmembers, escaped through the two left overwing emergency window exits. Those occupants in the rear of the cabin were almost overcome by smoke when they crowded at the ventral airstair door which could not be opened by the flight attendant. 1/

The aircraft cabin was configured to carry both passengers and cargo. The cargo was situated in front of the passengers on two pallets in the forward cabin. With the aircraft in this configuration, the forward left main cabin door was unusable. This configuration was permitted by the Federal Aviation Administration (FAA) when it issued the Boeing Company an exemption from compliance with the certification requirements of Civil Air Regulation (CAR) 4b. However, the FAA required Boeing to install a ventral airstair door emergency opening system on Boeing 727-100 aircraft which could be so configured. This same emergency system also was required on the 131-passenger Boeing 727-100 aircraft before issuing the exemption. 2/ The emergency opening system for the ventral airstair door was necessary to insure the availability of an emergency exit under adverse conditions. The system was designed to provide a positive minimum opening clearance if the normal system failed.

Inspection of the wreckage showed that the control for the emergency opening system for the ventral airstair door had not been activated. The flight attendant stationed in the rear of the aircraft had not been trained in the operation of the

1/ For more detailed information, read Aircraft Accident Report--"Continental Airlines/Air Micronesia, Inc., Boeing 727-92C, N18479, Yap Airport, Yap, Western Caroline Islands, November 21, 1980" (NTSB-AAR-81-7).
2/ A Boeing Company letter, reference 6-7330-1855, dated August 19, 1964, describes the reason for, and the operation of, the ventral door emergency exit system on Model 727 aircraft.

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emergency system and was not aware of the system. Other Air Micronesia flight attendants subsequently were questioned about the ventral airstair door emergency opening system, and none of those questioned was aware of its existence. Examination of Continental's Emergency Procedures Handbook (EPH) revealed no reference or mention of the emergency system. However, the emergency system was described in the FAA-approved flight manual. In fact, the flight manual listed a minimum necessary air pressure for the operation of the emergency opening system as a requirement on the minimum equipment list when the aircraft was flown in the cargo/passenger configuration. After the Yap accident, Continental trained its flight attendants and those of Air Micronesia on the operation of the emergency opening system. Continental also revised its EPH and changed its training simulator to duplicate the emergency controls for the ventral airstair door.

A second problem which became apparent during this investigation involved the inadequate marking and location of the emergency system controls for the ventral airstair door. The controls for both the normal and emergency systems are inside the tailcone area. They are positioned on the left stairwell wall looking aft near the rear pressure bulkhead. Individual access doors cover the controls for both systems. The access door for the normal control is forward of the access door for the emergency control and about 2 1/2 times larger. When the normal access door is opened, it completely hides the emergency system access door. This could be corrected simply by allowing the normal access door to hinge to the left rather than to the right, by relocating the emergency control, or by depicting the location of the emergency control with adequate placards.

Boeing records indicate that as many as 318 of its Boeing 727-100 series aircraft could have been equipped with the ventral airstair door emergency opening system. Records show that 91 of the Boeing 727-100C cargo/passenger aircraft and 164 Boeing 727-100 all-passenger aircraft were manufactured with this system. Subsequently, 63 modification kits were sold. The Safety Board is concerned that operators of these aircraft may not have provided the necessary training on the emergency opening system of the ventral airstair to their crewmembers, as was the case in this accident.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require that air carriers operating applicable Boeing 727 aircraft include emergency procedures for operation of the ventral airstair door in their training programs for cabin crews. (Class I, Urgent Action) (A-81-61)
>
> Issue an Airworthiness Directive on applicable Boeing 727 aircraft to require that the location of the emergency operating control for the ventral airstair door be readily apparent regardless of the position of the access door for the normal system control. (Class I, Urgent Action) (A-81-62)

KING, Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations. DRIVER, Vice Chairman, did not participate.

By: James B. King
Chairman

US Department
of Transportation

Federal Aviation Administration

Office of the Administrator

August 19, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-63 and A-81-64 issued by the Board on June 3, 1981. These recommendations resulted from the Board's investigation of an incident involving Northwest Orient Airlines Flight 79, climbing outbound from Dulles International Airport on January 31, 1981. Examination revealed that the number 3 nose cowl assembly and fan case had separated from the aircraft, and that the number 2 engine had ingested debris, resulting in foreign-object damage. Titanium fan blade failure was caused by a fatigue crack that propagated from a burned area on the leading edge of the blade.

A-81-63. Issue an airworthiness directive which requires a visual inspection for arc burns before and after each rework operation on titanium alloy fan blades from Pratt and Whitney Aircraft JT9D turbofan engines and requires replacement of arc burn-affected blades. We further recommend that a description of arc burn in titanium be included in the airworthiness directive.

FAA Comment. The Federal Aviation Administration (FAA) has completed a review of the incident data and available user information. JT9D engine and maintenance manuals call for the inspection of fan blades for arc burns, and arc burn inspection is specified during maintenance inspections and blade rework. Consequently, arc burn inspection is a routine maintenance function currently covered by engine and maintenance manuals. It should be noted that these manuals have recently been revised to highlight arc burn inspection by the addition of a caution note. The engine maintenance manuals are incorporated in the operators' approved maintenance program obviating the need for an airworthiness directive. According to FAA records the Northwest Airlines incident is the third blade failure resulting from a maintenance induced arc burn. Previous incidents occurred in 1969 and 1973. There are over 2300 engines in operation, each containing 40 to 48 fan blades, with total engine flight time exceeding 37 million hours. For these reasons we find that issuance of an airworthiness directive is unnecessary. However, our action in response to Safety Recommendation A-81-64 does include increased emphasis on the possibility of arc burns and includes a description of arc burn in titanium alloys. Accordingly, the FAA intends to take no further action relative to Safety Recommendation A-81-63, and we consider action completed on this recommendation.

A-81-64. Issue an air carrier maintenance bulletin urging operators and maintenance personnel to use extreme caution with any electrical equipment in the vicinity of titanium alloy fan blades to minimize the possibility of arc burn. This bulletin should also describe the appearance of arc burn in titanium and point out the nature of damage caused by such burns and the possible consequences of this damage.

FAA Comment. The FAA concurs in this recommendation. We have issued a maintenance bulletin instructing principal airworthiness inspectors to emphasize to their assigned operators that extreme caution should be used with any electrical equipment in the vicinity of titanium alloy fan blades to minimize the possibility of arc burn. A copy of applicable portions of this document is enclosed, and the FAA considers action completed on Safety Recommendation A-81-64.

Sincerely,

J. Lynn Helms
Administrator

Enclosure

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: June 3, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-63 and -64

At 1755 e.s.t., on January 31, 1981, Northwest Orient Airlines Flight 79, with 43 passengers, departed Dulles International Airport for Seattle, Washington. While climbing through 7,000 feet, the flightcrew noticed severe vibrations in the No. 3 engine, followed by a loud explosion. They shut down the No. 3 engine immediately. There was no fire or prior report of engine malfunction. The flight returned to Dulles and made a safe landing without further incident.

Examination of the Pratt and Whitney aircraft JT9D turbofan engine disclosed that the No. 3 [illegible] cowl assembly and fan case had separated from the aircraft. The No. 2 engine had ingested debris which resulted in foreign-object damage. The source of the debris is still under investigation.

Examination of the No. 30 first-stage, titanium fan blade by Safety Board and Pratt and Whitney metallurgists disclosed that the blade failed because of a fatigue crack that propagated from a burned area on the leading edge of the blade. The burned area appeared to have been caused by a high-energy electrical arc contacting the leading edge of the blade, which produced localized melting of the material. Subsequent rapid cooling to ambient temperatures caused local degradation of material properties and probable cracking of the forged titanium alloy. Visual examination of the blade revealed that the burned area had been mechanically blended after the blade had been shotpeened. The appearance of the microstructure at the fatigue crack origin indicated that portions of the heat-affected area associated with the arc burn had been partially removed by this blending operation. Although the Safety Board was not able to determine the cause of the arc burn, it and the other two known cases since 1969, both with JT9D engines, may have resulted from contact with electrical equipment.

Arc burns in titanium usually cause permanent subsurface damage that drastically reduces the strength of the material. The damage cannot be detected by inspection and cannot be removed by reworking without impairing blade performance.

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The Safety Board believes that the Federal Aviation Administration (FAA) should issue an airworthiness directive which includes a description of arc burn and requires a visual inspection for localized burning on all Pratt and Whitney titanium alloy fan blades and replacement of all affected blades. Furthermore, we suggest that the FAA use the following description in the airworthiness directive:

> Arc burn is evidenced by a small circular or semicircular heat-affected area on the blade surface that may contain shallow pitting, remelting, or cracking. Usually, a dark-blue oxide discoloration is associated with the heat-affected area.

Accordingly, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an airworthiness directive which requires a visual inspection for arc burns before and after each rework operation on titanium alloy fan blades from Pratt and Whitney Aircraft JT9D turbofan engines and requires replacement of arc burn-affected blades. We further recommend that a description of arc burn in titanium be included in the airworthiness directive. (Class II, Priority Action) (A-81-63)

> Issue an air carrier maintenance bulletin urging operators and maintenance personnel to use extreme caution with any electrical equipment in the vicinity of titanium alloy fan blades to minimize the possibility of arc burn. This bulletin should also describe the appearance of arc burn in titanium and point out the nature of damage caused by such burns and the possible consequences of this damage. (Class II, Priority Action) (A-81-64)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

James B. King

By: James B. King
Chairman

C5

US Department
of Transportation

**Federal Aviation
Administration**

September 10, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-65 through A-81-68 issued by the Board on June 23, 1981. These recommendations resulted from the Board's investigation of the crash of a Georgia-Pacific Corporation Cessna Citation, N501GP, at the Mercer County Airport, Bluefield, West Virginia, on January 21, 1981. The aircraft touched down between 500 to 2,000 feet on runway 23 which was covered with wet snow, and did not decelerate normally. About 1,200 feet from the departure end of the runway, the pilot added engine thrust and rotated the aircraft for liftoff; however, it did not get airborne because of insufficient flying speed. The aircraft overran the end of the runway and struck three localizer antennas and a 10-foot embankment before it plunged down a steep, densely wooded hillside. All five occupants were killed, and the aircraft was destroyed by impact forces and postcrash fire.

A-81-65. Require Cessna to include in the appropriate sections of all Citation aircraft flight manuals the portion of page IV-3 of the manufacturer's aircraft operating manual which pertains to landing on slippery runways.

A-81-66. Require Cessna to include in the appropriate sections of all Citation aircraft flight manuals a warning that solid ice, snow, or slush corrected landing distances may not be adequate in operations.

FAA Comment. The Federal Aviation Administration (FAA) agrees that all performance data available should be provided to the pilot in order to enhance safety. It should be noted that several FAA Approved Aircraft Flight Manuals (AFM) for current model business jets do provide landing distance factors that are applied to the basic landing field lengths when operating on wet or icy runways. However, as discussed in our response to Recommendation A-81-68, factors presently available are approximations only

and may or may not be conservative for some conditions. We therefore cannot support inclusion of these factors in an FAA approved flight manual or in an FAA approved section of a manual. Accordingly, the FAA does not concur in Safety Recommendation A-81-65, and we plan no further action. Although the Cessna slippery runway data may not provide total or completely accurate accountability, it will provide some accountability, and we would therefore not object to Cessna incorporating such data in an unapproved, segregated portion of the airplane flight manual. Regarding Safety Recommendation A-81-66, we find merit in the recommendation that a caution or warning be provided in the AFM that advises the pilot that computed landing field lengths may not be satisfactory for operation on solid ice, snow, or slush covered runways. We plan to evaluate this recommendation in greater depth, and the Board will be informed of our findings relative to Safety Recommendation A-81-66.

A-81-67. Through advisory circulars and/or operations bulletins, emphasize and reinforce in the training curricular for at least all turbojet initial and recurrent phases the limitations and the hazards that may be encountered when landing on slippery runways.

FAA Comment. The FAA concurs in this recommendation, and we plan to issue an operations bulletin to alert field inspectors to encourage slippery runway training in Part 91 operations. This training will be accomplished through certification and recurrent flight testing, in addition to a review of training curriculums for adequate coverage on this subject.

We also propose to revise AC 91-6A to include information about landing with low braking coefficients as a result of wet or icy runways. This revision will include samples of smaller turbojet aircraft (Citation, Lear, etc.) in addition to the larger turbojet aircraft now depicted. The Board will be informed when our action is completed on Safety Recommendation A-81-67.

A-81-68. Review and require revisions, as appropriate, of manufacturer's aircraft flight manuals to include sufficient slippery runway condition correction factor information or require an appropriate warning that landing distances under slippery runway conditions are unknown.

FAA Comment. The FAA concurs in the intent of this recommendation. However, present guidance on how to determine the correction factors results in rough approximations, and the quantitative numbers derived are difficult, if not impossible, to verify by flight test. The manufacturers are understandably reluctant to assume responsibility for additional information that cannot be verified by flight test. We would, however, not object to manufacturers incorporating slippery-runway landing data in an unapproved, segregated portion of the airplane flight manual or in an unapproved manual.

The FAA has tentatively scheduled a technical conference in November 1981 to discuss transport airplane takeoff performance requirements. All factors affecting takeoff and accelerate-stop distance, including wet runways, will

be discussed. Although this conference will primarily consider takeoff performance the factors affecting wet runway takeoff/accelerate-stop performance are generally applicable to landing performance.

Accordingly, it is our intent to delay further action on this recommendation until FAA evaluates the information resulting from this technical conference. This will allow for the development of a uniform airworthiness standard or acceptable test procedures which may serve as a basis for fulfilling the intent of Safety Recommendation A-81-68.

Sincerely,

J. Lynn Helms
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: June 23, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-65 through -68

On January 21, 1981, at 0844 e.s.t., a Georgia-Pacific Corporation Cessna Citation, N501GP, with the pilot, the copilot, and three passengers aboard, overran the end of runway 23 following an instrument landing system (ILS) approach, crashed, and burned at the Mercer County Airport, Bluefield, West Virginia. The aircraft touched down between 500 and 2,000 feet on the runway which was covered with wet snow, and it did not decelerate normally. About 1,200 feet from the departure end of the runway, the pilot added engine thrust and rotated the aircraft for liftoff: however, it did not get airborne because of insufficient flying speed. The aircraft overran the end of the runway and struck three localizer antennas and a 10-foot embankment before it plunged down a steep, densely wooded hillside. All five occupants were killed, and the aircraft was destroyed by impact forces and postcrash fire. 1/

The length of runway 23 is 4,742 feet; it is 100 feet wide and has a 0.3 percent effective downslope gradient. The runway is also grooved. The remaining runway beyond the glide slope touchdown point is 3,685 feet. The weather conditions at the time of the approach were: 700 feet, overcast, visibility 1 mile, light snow and fog, temperature 32° F, wind 070° at 10 knots and the braking action was reported poor.

The computed Vref for the approach was 107 KIAS. According to the Federal Aviation Administration (FAA) approved aircraft flight manual (AFM), the dry runway field length required with a 10-knot tailwind for the landing aircraft was 2,625 feet. Takeoff and landing performance data in the AFM are based only on a paved dry runway. The AFM does not contain correction factors to use in computing landing field length requirements when landing on wet or icy runways. However, according to the manufacturer's aircraft operating manual, which contains

1/ For more detailed information, read Aircraft Accident Report--"Georgia-Pacific Corporation Cessna 500 Citation, N501GP, Mercer County Airport, Bluefield, West Virginia, January 21, 1981" (NTSB-MAR-81-9).

information not required by regulation, a pilot can expect landing field length requirements to increase over the AFM values by 50 percent if the runway is wet, and 100 percent if it is icy. It is the Safety Board's understanding that these correction factors were based on National Aeronautics and Space Administration (NASA) test data for landing with low braking coefficients and from a computer model developed by the Cessna Aircraft Company. Using these factors, 3,937 feet of runway would have been required to stop the aircraft on a wet runway, and 5,250 feet would have been required to stop the aircraft on an icy runway. Furthermore, the maximum landing tailwind component for the aircraft is 10 knots, and at the time of the accident, about 9 knots was present. An excerpt from page IV-3 of the aircraft operating manual states the following:

> With 100 p.s.i. main tires, the CITATION's minimum dynamic hydroplaning initiating groundspeed is 90 kns. At typical landing weights, touchdown is normally accomplished below that speed. Since groundspeed is the critical factor, landing on slick runways with any tailwind component should be avoided.

In accordance with British Civil Airworthiness requirements, Citation aircraft manufactured for export to Great Britain have revisions to the AFM which, in part, increase the landing field lengths by 220 percent on wet and icy runways and restrict operators to landings only into a headwind and on a runway with an uphill gradient. The caution in the aircraft operating manual, therefore, indicates that the foregoing correction factors are inadequate when landing on wet or icy runways with a groundspeed in excess of 90 knots.

The pilot of the accident aircraft had a total of 10,463 hours of flight time; 7,609 hours as pilot-in-command, 5,002 hours in multiengine turbojets, and 3,642 hours in the Citation. A pilot with this amount of experience would be expected to be capable of achieving a thorough knowledge of the performance characteristics of his aircraft by, in part, reviewing all the pertinent aircraft information made available by FAA and the manufacturer. The Safety Board believes that the pilot was aware of the adverse runway condition and the aircraft's limitation to stop on the runway available because of his first attempt to land on runway 05 and the tailwind component present during the second approach to runway 23. Although the Safety Board believes that the pilot exercised poor judgment in attempting a landing on runway 23, it believes that the correction factors used in computing the required landing field length data and the effect the tailwind has on these correction factors are critical information to the safety of flight; therefore, this information should also be included in the AFM. The absence of this information in the AFM appears to be inconsistent with FAA's attempts at achieving a level of safety in accordance with previous practice. An example is the inclusion of similar runway condition correction factors in the AFM for the Gates Learjet aircraft.

A review of the Safety Board's accident files for the period 1970 to 1980 disclosed four other Citation overshoot accidents which involved water/ice on the runway under unfavorable wind conditions. A fifth accident involved a loss of control on takeoff and an attempted abort with an 11-knot tailwind and blowing snow. The range of total flight experience of the pilots involved in these accidents was between 2,600 and 10,000 hours and the total flight time in type ranged between 250 and 750 hours.

The Safety Board believes there is a legitimate need to emphasize and reinforce the landing performance of the Citation under wet and icy runway conditions and that the critical factor under these conditions is groundspeed. It should be made clear that

any landing in excess of 90 knots should not be attempted under the foregoing conditions and the required landing distance cannot be determined because the correction factors used are not adequate. The importance of this information was recognized by the British Civil Aviation Authority by its modification of the AFM and the inclusion of additional restrictions.

It should also be noted that reliable runway condition correction factors involving solid ice, snow, or slush are most difficult to determine and, therefore, a pilot should be skeptical of those correction factors when a landing attempt is made on a runway with either of these surface conditions. The inclusion of that information in the AFM by the manufacturer should serve as a warning that a hazardous situation may be encountered under these conditions.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require Cessna to include in the appropriate sections of all Citation aircraft flight manuals the portion of page IV-3 of the manufacturer's aircraft operating manual which pertains to landing on slippery runways. (Class II, Priority Action) (A-81-65)
>
> Require Cessna to include in the appropriate sections of all Citation aircraft flight manuals a warning that solid ice, snow, or slush corrected landing distances may not be adequate in operations. (Class II, Priority Action) (A-81-66)
>
> Through advisory circulars and/or operations bulletins, emphasize and reinforce in the training curricular for at least all turbojet initial and recurrent phases the limitations and the hazards that may be encountered when landing on slippery runways. (Class II, Priority Action) (A-81-67)
>
> Review and require revisions, as appropriate, of manufacturer's aircraft flight manuals to include sufficient slippery runway condition correction factor information or require an appropriate warning that landing distances under slippery runway conditions are unknown. (Class II, Priority Action) (A-81-68)

DRIVER, Vice Chairman, and McADAMS and BURSLEY, Members, concurred in these recommendations. KING, Chairman, and GOLDMAN, Member, did not participate.

James B. King

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

September 14, 1981

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Reference is made to your letter dated August 19, 1981, responding to National Transportation Safety Board Safety Recommendation A-81-69 issued June 29, 1981. This recommendation stemmed from our investigation of an incident involving a Continental Oil Company Learjet Model 25 on December 7, 1980. Both the General Electric CJ610-6 engines flamed out above 40,000 feet while the aircraft was in a climb. Service history of Learjets equipped with the General Electric CJ610-6 engines reveal at least 30 other instances of engine flameout at high altitudes. We recommended that the Federal Aviation Administration (FAA):

> Issue an Airworthiness Directive to: (1) require, at appropriate periodic intervals, the performance of the altitude acceleration and stall check procedure defined in the CJ610-6 overhaul manual on Lear aircraft with General Electric CJ610-6 engines installed; and (2) restrict the maximum operating altitude of those engines shown by the test procedure to have a reduced altitude stall margin until the manufacturer has developed a satisfactory method for recovering stall margin and it is incorporated in those engines.

We have examined General Electric Service Bulletin 72-140 dated June 26, 1981, and General Aviation Maintenance Bulletin, Notice 8620.14 dated July 18, 1981. These documents satisfy the intent of Safety Recommendation A-81-69 which we now classify in a "Closed--Acceptable Alternate Action" status.

We thank the FAA for actions taken.

Sincerely yours,

James B. King
Chairman

US Department
of Transportation

**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C.

August 19, 1981

The Honorable James B. King
Chairman, National Transportation
  Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-81-69 issued by the Board on June 29, 1981. This recommendation resulted from the Board's investigation of the cause of flameouts of General Electric CJ610-6 engine-equipped Lear aircraft. The Board determined that the flameouts were caused by reduced engine stall margin due to excessive compressor blade tip clearance and excessive compressor case runout.

A-81-69. Issue an Airworthiness Directive to: (1) require, at appropriate periodic intervals, the performance of the altitude acceleration and stall check procedure defined in the CJ610-6 overhaul manual on Lear aircraft with General Electric CJ610-6 engines installed; and (2) restrict the maximum operating altitude of those engines shown by the test procedure to have a reduced altitude stall margin until the manufacturer has developed a satisfactory method for recovering stall margin and it is incorporated in those engines.

FAA Comment. This recommendation is the result of a December 7, 1980, incident involving a Continental Oil Company CJ610-6 powered Model 25 Learjet. The aircraft sustained a dual engine flameout while climbing through 40,000 feet, necessitating an emergency descent through adverse weather conditions to the certified engine relight envelope upper limit of 25,000 feet. At that time, successful restarts of both engines were accomplished and a normal landing was made.

Comprehensive inspection and performance testing of these two CJ610-6 engines, conducted jointly by the Federal Aviation Administration (FAA), NTSB, and General Electric, indicated that both engines, which had recently been overhauled, possessed reduced high altitude operating capability. Analytical disassembly and inspection of each engine documented compressor tip clearances which were in excess of the approved engine overhaul manual limitations. Performance testing, following restoration of overhaul manual clearances,

demonstrated full certified altitude operating capability. The performance checks were run in accordance with the maximum altitude acceleration and surge margin check procedures presently contained in the CJ610 maintenance manual (SEI-186). The maintenance manual requires this performance check following every overhaul or maintenance procedure which affects performance.

After an extensive review of CJ610-6 engine service history and maintenance practices, the FAA has concluded that the probable cause of engine stall/flameouts is a result of excessive compressor clearances, induced at overhaul, and use of relaxed maintenance procedures. This condition of excessive compressor clearances has resulted in less than 100 percent compliance with the required post-overhaul/major maintenance altitude performance check. Service history records do not contain evidence of stall/flameout incidents on engines with compressor clearances within limitations and which have complied with the maintenance manual altitude performance check.

General Electric has also developed and demonstrated various mechanical and operational techniques, in addition to compressor tip clearance restoration, for recovering stall margin. These techniques have been tested by the engine and aircraft manufacturers and approved by the FAA. General Electric Service Bulletin 72-140 delineates these stall margin techniques and includes modified performance check procedures to verify their effectiveness.

In addition, the FAA participated in a flight test sample program involving 10 engines, installed on various operators' aircraft, which were selected to cover a wide range of operators, overhaul shops, and engine operating hours. The flight test was designed to assess the suspect engine population and demonstrate the effectiveness of the stall margin recovery techniques. Only one engine was identified to have inadequate altitude performance, and the stall margin recovery techniques were then demonstrated to be fully effective in restoring performance.

In consideration of the foregoing, the FAA has reached the following conclusions:

1. The probable cause of high altitude engine stall/flameout is excessive compressor tip clearances induced at overhaul or during major maintenance. The condition was not detected due to lack of compliance with the maximum altitude acceleration and surge margin check required by the maintenance manual. The number of CJ610-6 powered Learjet stall/flameout incidents would have been significantly reduced had these requirements been met.

2. Based on the flight test sample program, the number of suspect engines in service is considered to be minimal. The maximum altitude acceleration and surge margin check and the stall margin recovery techniques contained in General Electric Service Bulletin 72-140 are, respectively, effective in identifying and correcting deficient engines.

3. CJ610-6 stall/flameout incidents are a maintenance-induced problem and not a design deficiency.

Accordingly, the FAA does not agree that an airworthiness directive is warranted in this situation. We find that this recommendation can be satisfied through the issuance of a General Aviation Maintenance Bulletin. On July 18, 1981, the FAA issued General Aviation Maintenance Bulletin, Notice 8620.14. This bulletin requests FAA field inspectors to advise operators who have not performed a maximum altitude acceleration and surge margin check since engine installation do so at the first opportunity, but in any event, no later than the next hot section inspection. General Electric Service Bulletin 72-140, which delineates FAA approved stall margin recovery techniques, is also referenced in Notice 8620.14. In addition, the notice has requested that the results of the performance check be reported to the FAA. These results will be used to verify the suspect engine population and, should these statistics indicate an unacceptable number of deficient engines, further appropriate steps will be implemented. A copy of Notice 8620.14 and General Electric Service Bulletin 72-140 is enclosed for your information. The FAA considers action completed on Safety Recommendation A-81-69.

Sincerely,

J. Lynn Helms
Administrator

Enclosures

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: June 29, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-81-69

On December 7, 1980, both engines of a Continental Oil Company Lear Model 25 flamed out at about 40,000 feet while the aircraft was climbing to 43,000 feet northwest of Childress, Texas. An emergency descent was made through heavy rain, turbulence, and lightning, during which airstart attempts were not successful. However, after passing through 25,000 feet, the engines were restarted and the aircraft made a precautionary landing at Childress. No one was injured, and the aircraft was not damaged.

An investigation into the cause of the flameouts was conducted by the Safety Board with the assistance and cooperation of the Federal Aviation Administration's New England Region Engineering and Manufacturing Branch and the General Electric Co., the engine manufacturer.

Extensive testing and a teardown examination of the General Electric CJ610-6 engines determined that the flameouts were caused by reduced engine stall margin due to excessive compressor blade tip clearance and excessive compressor case runout. Although both engines had been overhauled shortly before the incident, no evidence was found to confirm that the problem could have originated at overhaul. The manufacturer could not explain the cause of the case runout and tip rub that led to increased clearances.

A review of the service history between 1976 and 1980 of General Electric CJ610-6 engine-equipped Lear aircraft revealed at least 30 other instances of engine flameout at altitude, although the December 7, 1980, incident was the only reported instance of the loss of both engines. Sixteen of the reported flameouts were attributed to excessive compressor clearances. Nearly all of the flameouts occurred at altitudes near or above 40,000 feet. Some other aircraft are equipped with CJ610-6 engines, but those aircraft are generally operated at lower altitudes than the Lear aircraft. The service history of those aircraft has been reviewed and only two incidents of flameout were reported during the same period.

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The Safety Board is aware that the engine and aircraft manufacturers are conducting a test and research program to develop a solution to the loss of engine stall margin. However, we are concerned that until a method is developed for recovering or preventing reduction of stall margin, the potential for an accident exists. Because the engine maintenance and overhaul manuals provide a method for determining loss of stall margin, the Safety Board believes it should be used periodically to check engines for decreased stall margin and that appropriate operating restrictions should be applied to those engines so identified.

The manufacturer has proposed a one-time altitude stall and acceleration check to identify engines for which a stall margin recovery fix would be necessary. However, those engines which pass this check may later develop a reduced altitude stall margin. For this reason, the Safety Board believes the check should be required periodically to identify engines which might be susceptible to altitude flameout.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Airworthiness Directive to: (1) require, at appropriate periodic intervals, the performance of the altitude acceleration and stall check procedure defined in the CJ610-6 overhaul manual on Lear aircraft with General Electric CJ610-6 engines installed; and (2) restrict the maximum operating altitude of those engines shown by the test procedure to have a reduced altitude stall margin until the manufacturer has developed a satisfactory method for recovering stall margin and it is incorporated in those engines. (Class II, Priority Action) (A-81-69)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, *Members*, concurred in this recommendation.

James B. King

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

September 18, 1981

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Thank you for your letter of August 24, 1981, responding to National Transportation Safety Board Safety Recommendation A-81-70 issued July 10, 1981. This recommendation stemmed from our investigation of an incident involving a Northwest Airlines DC-10-40 on January 31, 1981. Shortly after takeoff from Dulles International Airport, the No. 3 engine nose cowl assembly and fan case separated from the engine. We recommended that the Federal Aviation Administration (FAA) review the design of the flanges and fasteners on the forward and aft faces of the fan case of the JT9D turbofan engine to insure that the intent of airworthiness requirements provided in 14 CFR 33 and 14 CFR 25 are satisfied.

We are pleased to note that this recommendation is being evaluated by the FAA, McDonnell Douglas, and Pratt and Whitney Aircraft. We appreciate the FAA's offer to keep the Safety Board informed of its findings. Pending the FAA's further response, Safety Recommendation A-81-70 will be maintained in an "Open--Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

US Department
of Transportation

**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

August 24, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-81-70 issued by the Board on July 10, 1981. This recommendation resulted from the Board's investigation of an incident involving a Northwest Airlines, Inc., DC-10-40. The flight departed Dulles International Airport for Seattle, Washington, on January 31, 1981. While climbing through 6,000 feet, the flightcrew heard a loud noise, detected indications of a failure of the No. 3 engine, and felt airframe vibrations. The engine was shut down successfully and the flight returned to Dulles without further incident.

Examination of the aircraft revealed that the No. 3 engine nose cowl assembly and the fan case had separated from the engine. The No. 30 fan blade had separated from the fan disc about 1 inch above the blade platform as a result of a chordwise fatigue crack and overload fracture, which initiated at an arc burn point. The Safety Board determined that when the fan blade fractured, it struck the fan case and the inner nose cowl near the 6 o'clock position causing the loss of 2 to 5 A-flange nose cowl retention bolts in the area of the impact. The engine dynamic imbalance and the aerodynamic loads on the engine nose cowl loaded the remaining A-flange fasteners beyond their tensile strength and the flange joint began to separate.

A-81-70. Review the design of the flanges and fasteners on the forward and aft faces of the fan case of the JT9D turbofan engine to insure that the intent of airworthiness requirements provided in 14 CFR 33 and 14 CFR 25 are satisfied.

FAA Comment. The Federal Aviation Administration (FAA) is currently evaluating the structural integrity, under failure conditions typical of the Dulles incident, of the aircraft nose cowl attachment hardware which interfaces with the engine forward "A" flange. A preliminary Douglas Aircraft Service Bulletin, developed in coordination with Pratt & Whitney Aircraft, is currently under review by our Northwest and New England Regions. Moreover, we have received a preliminary proposal from Pratt & Whitney Aircraft to increase the structural capability of the rear fan case "B" flange by increasing flange shear strength and incorporating flange attachment bolts having greater strain energy capacity.

Further analysis and review of these proposed aircraft and engine modifications is necessary to ensure compatibility of these design changes with both aircraft and engine requirements. This additional analysis is also necessary to ensure adequacy of the design changes under engine blade failure conditions and the full range of aircraft flight conditions and resultant aerodynamic loading.

Our investigation is continuing and the Board will be informed of our findings when completed.

Sincerely,

J. Lynn Helms
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 10, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-70

At 1755 eastern standard time, January 31, 1981, a Northwest Airlines, Inc., DC-10-40 departed Dulles International Airport for Seattle, Washington. While climbing through 6,000 feet, the flightcrew heard a loud noise, detected indications of a failure of the No. 3 engine, and felt airframe vibrations. The engine was shut down successfully, and there was no fire. The flight returned to Dulles and made a safe landing without further incident.

On May 15, 1981, as a result of the early metallurgical findings which indicated that the No. 30 fan blade in the No. 3 engine had failed at a point where it had been subjected to an electrical arc burn, the Safety Board adopted Safety Recommendations A-81-63 and -64 to the Federal Aviation Administration addressing the need for caution in conducting maintenance and inspection of titanium fan blades on the Pratt and Whitney JT9D-20 high-bypass turbofan engines. As the investigation continued, problems regarding the structural design of the nose cowl assembly, the fan case, the fan exit case, and their attaching mechanisms became evident.

Examination of the aircraft revealed that the No. 3 engine nose cowl assembly and the fan case had separated from the engine. The No. 30 fan blade had separated from the fan disc about 1 inch above the blade platform as a result of a chordwise fatigue crack and overload fracture, which initiated at the arc burn point. Of the 20 nose cowl-to-engine fan case attachment bolts on A-flange, 13 were missing, 6 had failed in shear, and 1 had pulled out of its nutplate. There were indications that some of the missing bolts had pulled out of their nutplates and that five of the fan case attachment lugs had failed laterally in bearing load.

The Safety Board determined that when the fan blade fractured, it struck the fan case and the inner nose cowl near the 6-o'clock position causing the loss of 2 to 5 A-flange nose cowl retention bolts in the area of the impact. The impact loads may have also caused B-flange bolt fractures and B-flange breakout in an area corresponding to the A-flange failures. The engine dynamic imbalance and the aerodynamic loads on the engine nose cowl loaded the remaining A-flange fasteners beyond their tensile strength and the flange joint began to separate.

3252-B

The bolts sheared in a sequential circumferential (unzipping) manner until only fasteners between the 1- and the 3-o'clock positions remained. Aerodynamic forces then lifted the cowl away from the engine, pivoting about the remaining bolts, stripping the bolts from their nutplates, and bending the flange backward and outboard. The cowl separated upward and outward and struck right wing slat No. 5. As the A-flange fasteners progressively separated, additional aerodynamic loading caused interaction between the fan blade tips and the fan case, and caused increased loading on the B-flange. The torsional loads imposed by fan blade tips striking the fan case and the additional aerodynamic loading caused failure of the B-flange fasteners. The unrestrained fan case moved in and out of the fan exit case and struck the fan exit guide vanes at random locations. The fan case was driven forward and was radially swung away from the engine, striking the fan exit case. The impact caused the fracture of a small section of the fan exit case B-flange and bent it backward and inboard. The fan case departed upward and inward and struck leading edge Nos. 1 and 2 slats on the right wing. The nose cowl and fan case from the No. 3 engine came to rest in a populated area.

Postincident examination also revealed that the Nos. 1, 2, and 5 leading edge slats on the right wing, and the No. 2 engine, had been damaged by foreign objects from No. 3 engine components and debris. Visual inspection of the No. 2 engine fan rotor revealed that 32 of the 46 fan blades had received such damage, which ranged from 0.030-inch nicks to 2- to 3-inch sections missing from the blades' leading edges at blade station 23.5, just below the outboard shroud. Six damaged blades from the No. 2 engine were examined metallurgically in an attempt to determine the composition of the material that the No. 2 engine had ingested. A test sample of material deposited on the No. 25 blade contained significantly higher quantities of iron than the titanium alloy of the fan blades. The fan case and fan exit case are made of stainless steel, which contains iron; consequently, fragments from these two components of the No. 3 engine probably damaged the No. 2 engine. With regard to the JT9D engine and its installation on DC-10 aircraft, the engine manufacturer is responsible for compliance with 14 CFR 33 and the aircraft manufacturer is responsible for compliance with 14 CFR 25. The nose cowl and fasteners for attachment to the JT9D engine are provided by the aircraft manufacturer but the cowl is fastened to the A-flange of the engine fan case which is provided by the engine manufacturer. It appears in this incident that the broken fan blade damaged the A-flange and fasteners (and probably the B-flange and fasteners) which allowed the nose cowl and fan case to separate from the engine in response to dynamic imbalance loads, aerodynamic loads, and fan-fan case interaction loads. We conclude that the failure of a single blade resulted in the loss of major engine components, foreign object damage to the No. 2 engine, and structural damage to leading edge devices. Although we recognize that this was the only failure of this type of engine installation, the Safety Board is concerned that these regulations as they existed for certification may not have been met with regard to the JT9D engine and its installation on the DC-10 aircraft.

The No. 30 fan blade from the No. 3 engine, serial No. BU9913, had accumulated 14,864 flight-hours and 9,699 cycles. It had been last inspected on December 9, 1980, and no discrepancies were noted. Since that time, the engine had been operated 306 hours and had accumulated 134 cycles. The blade had been reworked by TRW Components Division of TRW, Inc., Cleveland, Ohio, in November and December 1979. At that time, the following were accomplished: (1) Service Bulletin No. 4060, glass bead peening; (2) routine blending and overhaul; (3) hardface strip/removal; (4) rehardfacing; and (5) fluorescent dye penetrant inspection. As part of the incident investigation, the Safety Board observed both fan blade rework and overhaul processing procedures at the facilities of TRW, Inc., in Cleveland, and at Northwest Airlines' facilities in Minneapolis, Minnesota. No discrepancies in rework and processing procedures were identified.

Fourteen JT9D fan blade failures have been reported to the manufacturer since the engine went into service. Six failures have occurred on JT9D engines installed on DC-10 aircraft, and eight failures have occurred on JT9D engines installed on Boeing 747 aircraft. Damage to the 13 previous aircraft involved has varied from minor internal engine damage to engine nose cowl or fan case penetration to thrust reverser separation.

In the incident investigated, the Safety Board believes that the safe operation of the aircraft was jeopardized by the damage to the No. 2 engine and the leading edge devices, which resulted from the failure to contain the damage to the No. 3 engine. Therefore, the Safety Board recommends that the Federal Aviation Administration:

> Review the design of the flanges and fasteners on the forward and aft faces of the fan case of the JT9D turbofan engine to insure that the intent of airworthiness requirements provided in 14 CFR 33 and 14 CFR 25 are satisfied. (Class II, Priority Action) (A-81-70)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

James B. King

By: James B. King
Chairman

AD-A115 485 FEDERAL AVIATION ADMINISTRATION WASHINGTON DC OFFICE--ETC F/G 5/4
SUMMARY OF FEDERAL AVIATION ADMINISTRATION RESPONSES TO NATIONA--ETC(U)
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US Department
of Transportation

**Federal Aviation
Administration**

Office of the Administrator

September 11, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-71 and A-81-72 issued by the Board on July 10, 1981. These recommendations resulted from the Board's investigation of fatigue failures of the tail rotor pitch change horn, P/N 350A-12-1368-01, in Aerospatiale AS350 model helicopters.

A-81-71. Take immediate action to revise the existing inspection instructions of AD-81-13-09 to stress the importance of thoroughly cleaning the pitch change horn in the area of the mounting bolt countersinks and adjacent yoke radii before performing the dye penetrant and visual inspections required.

A-81-72. Expedite review of the recent failure history and existing flight-load data on the AS350, PN350A-12-1368-01, tail rotor pitch change horn and issue an Emergency Airworthiness Directive to establish a life limit for the part.

FAA Comment. The Federal Aviation Administration (FAA) has reviewed the reported service problems or failures of the tail rotor pitch horn, P/N 350-A12-1368-01, and concurs in these recommendations. The French airworthiness authority has issued an airworthiness directive (AD) to require inspections and to establish a temporary 450-hour service life. This action duplicates the manufacturer's Telex Service Bulletins Numbers 01.07A and -B.

The FAA has taken similar action and an immediately adopted rule AD, Amendment 39-4175, was issued on July 16, 1981. A copy of the AD is enclosed for your information. The provisions of this AD satisfy the intent of both recommendations, A-81-71 and -72. Subparagraph (d)(1) of the AD responds to Safety Recommendation A-81-71 and states: "Clean thoroughly, the surface of each horn at the two mounting bolts." Subparagraphs (g)(1) and (2) respond to Safety Recommendation A-81-72 in establishing a 450-hour service life.

Safety Recommendation A-81-72 also states that the FAA should review existing flight-load data regarding the tail rotor pitch horn. The various Aerospatiale helicopter designs are type certificated under the import aircraft type certification provisions of FAR 21.29 and the bilateral airworthiness agreement between the United States and France. The agreement provides for FAA certification of the helicopter design predicated, in part, on the French airworthiness authority's certification that the design meets the applicable U.S. standards. Accordingly, and consistent with the provisions of paragraphs 5 and 6 of the U.S./French agreement, the French airworthiness authority and the type certificate holder are continuing to monitor this program and are evaluating all available data, existing and newly acquired, to determine the validity of the current established life limit (450 hours) for both P/N's in the AD. If the evaluation and review support life limits other than that given in U.S. and French airworthiness directives, we will initiate action to amend the AD accordingly. We will continue to work closely with the French airworthiness authorities in this matter and will take whatever additional corrective action that we consider necessary. The FAA considers action completed on Safety Recommendations A-81-71 and A-81-72.

Sincerely,

J. Lynn Helms
Administrator

Enclosure

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 10, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-71 and -72

On June 27, 1981, an Aerospatiale AS350 helicopter, N1381BH, experienced a severe tail rotor vibration while in flight. The pilot was able to execute a successful emergency landing. The tail rotor vibrated because a tail rotor pitch change horn, PN350A12-1368-01, had failed as a result of fatigue cracking where it attaches to the blade root. Total operating time on the failed part was 950 hours.

In recent months, there have been four similar fatigue failures of the tail rotor pitch change horn, one in Canada and three in the United States. Operating times ranged from 450 to 1,800 hours. The pitch change horn presently has no prescribed life limit. The most recent failure occurred despite the operator's compliance with Federal Aviation Administration Emergency Airworthiness Directive 81-13-09 dated June 16, 1981, which made Aerospatiale Telegraphic Service Bulletin 01.07A mandatory for all Aerospatiale AS350 model helicopters (173 AS350 helicopters are registered in the United States). The AD required the following inspection criteria:

> Within 10 flight-hours, remove the pitch change horns from the two tail rotor blades, thoroughly clean the mounting bolt areas of the horn flange, conduct a fluorescent dye penetrant inspection of the horns for evidence of cracks, thoroughly clean the mating surfaces of the horn and the blade root flange, and check for flatness of the mating surfaces by performing a trial installation. Once reassembled, conduct a daily preflight visual inspection of the pitch horns using a 5 power magnifying glass in the area of the mounting bolt countersink and adjacent radii of the yoke.

Although the pitch change horn on the accident aircraft had been inspected in accordance with the Airworthiness Directive, the existing fatigue area had apparently missed detection. The Board noted when examining the failed part that the horn surface had been cleaned but residue remained in the area of the fatigue cracks.

3304

The manufacturer has indicated to the Safety Board that a 400-hour service life for the PN350A12-1368-01 tail rotor pitch change horn is being considered. The Safety Board believes that this proposed action should be reviewed expeditiously to determine a proper life limit on the tail rotor pitch change horn.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Take immediate action to revise the existing inspection instructions of AD-81-13-09 to stress the importance of thoroughly cleaning the pitch change horn in the area of the mounting bolt countersinks and adjacent yoke radii before performing the dye penetrant and visual inspections required. (Class I, Urgent Action) (A-81-71)

> Expedite review of the recent failure history and existing flight-load data on the AS350, PN350A-12-1368-01, tail rotor pitch change horn and issue an Emergency Airworthiness Directive to establish a life limit for the part. (Class I, Urgent Action) (A-81-72)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

US Department
of Transportation

**Federal Aviation
Administration**

September 24, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-77 through A-81-79 issued by the Board on July 28, 1981. These recommendations resulted from the Board's investigation of the crash of a Houston Helicopters Bell 206, N1077H, in the Gulf of Mexico on March 25, 1981. Following engine failure at 500 feet m.s.l. during cruise flight, the pilot entered autorotation and attempted to deploy the emergency floats by triggering the emergency float inflation switch. The floats failed to deploy and the aircraft struck the water gently, rolled over, and floated inverted. The pilot and five passengers aboard escaped without injury.

The Safety Board's investigation disclosed that the emergency flotation pneumatic system valve failed to actuate and inflate the float bags. The valve assembly consists of an integral piston pin, shear head, and an electrically fired squib charge. When the squib is fired, the piston pin releases the shear head and nitrogen gas inflates the float bags. Examination of the Futurecraft Corporation valve assembly revealed that although the squib charge had fired, the shear head release piston pin was incorrectly installed and was wedged in the machined groove of the shear head. The binding of the piston pin in the machined groove prevented release of the shear head and nitrogen gas to inflate the float bags. As noted in the text of these recommendations, Bell Helicopter issued Alert Safety Bulletin No. 206L-81-21, dated May 7, 1981. This bulletin describes methods of inspecting the piston pin for correct installation in relation to the shear head. A copy of this document is enclosed.

FAA General Comment. The Federal Aviation Administration's (FAA) Service Difficulty Reporting System (SDR) was used to identify data concerning these recommendations. The data base contained 28 reports relative to the emergency flotation section of the AS350, BO105, S5B, B206, B212, and

Hughes 369 helicopters. The system did not identify the Futurecraft Corporation valve assembly, nor the piston pin or shear head. Three of these reports contained the following information:

Component Name	Part Name	Part #	Part Condition	Make/Model
Emerg. Flotation Sec.	Valve	811341	corroded	Bell 206B
Emerg. Flotation Sec.	Valve	206073915005	corroded	Bell 20621
Emerg. Flotation Sec.	Valve	212050207011	defective	Bell 212

A-81-77. Issue an Airworthiness Directive making the provisions of Bell Helicopter Alert Service Bulletin No. 206L-81-21 mandatory for all 206L Series Aircraft.

FAA Comment. The FAA concurs in this recommendation and plans to issue an Airworthiness Directive (AD) to make the provisions of the Bell Helicopter Alert Service Bulletin mandatory and to require installation of an improved shear head release piston pin. The Safety Board will be provided a copy of this AD when issued, and the FAA considers action completed on Safety Recommendation A-81-77.

A-81-78. Assess the need to modify the Futurecraft Corporation valve shear head release piston pin to minimize the possibility of installing the piston pin incorrectly.

FAA Comment. The FAA concurs in this recommendation and the Futurecraft Corporation has modified the shear head release piston pin to preclude improper operation. This modified pin will be a requirement included in the aforementioned AD. The FAA considers action completed on Safety Recommendation A-81-78.

A-81-79. Determine whether other models of helicopter aircraft equipped with emergency flotation equipment use the same Futurecraft Corporation valve and take appropriate corrective action to advise the operators of those aircraft of the potential problem.

FAA Comment. The FAA concurs in this recommendation. We have determined that some Bell Model 206B's use this same piston and, like the Model 206L, the design does not include a mechanical backup to be used in case the squib malfunctions. The aforementioned AD, requiring replacement of the shear head release piston pin, will include the affected Model 206B's.

Bell Models 212, 222, and 412 use a similar design to the Models 206B and 206L. However, these designs include scribe marks to assure correct alignment of the piston pin and provide a mechanical backup in the event the squib does not fire properly. We do not plan to require any mandatory corrective action for these helicopters.

Aerospatiale Models AS350D, E, and F employ a piston pin that is similar to the one used on the Bell Model 206L. These piston pins come as part of a kit from Air Cruiser of Belmar, New Jersey, and the company has forwarded

recommended service information to Aerospatiale for issuance. This system has a mechanical backup release available in case of squib malfunctions. Because of the availability of the mechanical backup and lack of similar service difficulties, mandatory corrective action is not required for the Models AS-350.

The MBB BO-105 helicopter also utilizes a piston that is similar to the one in Bell 206L aircraft and, like the Bell 206L, does not have a mechanical backup available in case of squib malfunctions. We understand there are about 12 helicopters that incorporate this modification, all involved in flight activities by the same operator. Proposed service information has been provided by Air Cruiser for inspection of these installations. The FAA Eastern Region will monitor the situation to assure issuance of the service information and accomplishment of required action on U.S. registered helicopters. We will also inform the West German airworthiness authority of the subject accident, the results of our investigation, and the action we are taking on affected U.S. registered MBB BO-105 helicopters, in order that they might review the situation for MBB BO-105 helicopters operating in other countries.

Based on our discussions with Futurecraft Corporation and Air Cruiser, we find the above listing of helicopters complete in regard to the problem being addressed. Accordingly, the FAA considers action completed on Safety Recommendation A-81-79.

Sincerely,

Helms

J. Lynn Helms
Administrator

Enclosure

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 28, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-77 through -79

On March 25, 1981, a Houston Helicopters Bell 206, N1077H, experienced an engine failure at 500 feet m.s.l. during cruise flight over Brazos Block 578 in the Gulf of Mexico. The pilot entered autorotation and attempted to deploy the emergency floats by triggering the emergency float inflation switch. The floats failed to deploy and the aircraft struck the water gently, rolled over, and floated inverted. The pilot and five passengers aboard escaped without injury.

Investigation disclosed that the emergency flotation pneumatic system valve failed to actuate and inflate the float bags. The valve assembly consists of an integral piston pin, shear head, and an electrically fired squib charge. When the squib is fired, the piston pin releases the shear head and nitrogen gas inflates the float bags. Examination of the Futurecraft Corporation valve assembly revealed that although the squib charge had fired, the shear head release piston pin was incorrectly installed and was wedged in the machined groove of the shear head. The binding of the piston pin in the machined groove prevented release of the shear head and nitrogen gas to inflate the float bags. The manufacturer of the squib valve has reported 12 cases of improperly installed shear head release piston pins.

As a direct result of this accident, Bell Helicopter issued Alert Safety Bulletin No. 206L-81-21, dated May 7, 1981. This bulletin describes methods of inspecting the piston pin for correct installation in relation to the shear head.

Because of the serious consequences of this failure and the potential for similar failures, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Airworthiness Directive making the provisions of Bell Helicopter Alert Service Bulletin No. 206L-81-21 mandatory for all 206L Series Aircraft. (Class II, Priority Action) (A-81-77)

3301

Assess the need to modify the Futurecraft Corporation valve shear head release piston pin to minimize the possibility of installing the piston pin incorrectly. (Class II, Priority Action) (A-81-78)

Determine whether other models of helicopter aircraft equipped with emergency flotation equipment use the same Futurecraft Corporation valve and take appropriate corrective action to advise the operators of those aircraft of the potential problem. (Class II, Priority Action) (A-81-79)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

James B. King

By: James B. King
Chairman

US Department
of Transportation

**Federal Aviation
Administration**

September 30, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-81-82 issued by the Board on August 3, 1981. This recommendation resulted from the Board's investigation of an accident involving a Hughes 500C helicopter near Kivalina, Alaska, on August 2, 1980. The pilot of the nonscheduled air taxi flight started a descent from 3,000 feet toward a landing site, during which the power turbine speed (N_2 rpm) climbed from the normal indication of 103 percent to 120 percent, resulting in an overspeed. When the pilot was not able to reduce electrically the excessive turbine speed, he increased the collective to increase torque and attempted to manually control the governor. When this action was also ineffective in reducing the power turbine speed, the pilot elected to enter an autorotation. During touchdown on rolling terrain, the helicopter's main rotor blades flexed downward and severed the tailboom. The pilot, the sole occupant, escaped injury.

As a result of its evaluation, the Safety Board concluded that the power turbine overspeed resulted from metal contamination, which caused the speed weight to seize. On November 14, 1979, the Detroit Diesel Allison Company issued Commercial Engine Service Bulletin CEB-1144, warning that the high pressure fuel filter bypass valve is subject to wear and should be replaced with kit P/N 6896726; the kit includes a replacement filter element for improved service life. The operator of the accident aircraft had not complied with this service bulletin.

A-81-82. Issue an Airworthiness Directive to require compliance with the Detroit Diesel Allison Commercial Engine Service Bulletin CEB-1144.

FAA Comment. The Federal Aviation Administration (FAA) concurs in this recommendation.

We have determined that approximately 50 percent of the applicable owners/operators have complied with CEB-1144. Our Great Lakes Region has coordinated with Detroit Diesel Allison to revise CEB-1144 as an ALERT (mandatory compliance) Engine Bulletin within the next 30 days. Accordingly, an airworthiness directive (AD) will be submitted for publication within the next 90 days to make compliance with the forthcoming revision of CEB-1144 mandatory. A copy of the AD will be provided the Board and, with issuance of this document, the FAA considers action completed on Safety Recommendation A-81-82.

Sincerely,

Helms

J. Lynn Helms
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 3, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-81-82

On August 2, 1980, a Hughes 500C helicopter was on a nonscheduled air taxi flight near Kivalina, Alaska. The pilot started a descent from 3,000 feet toward a landing site, during which the power turbine speed (N_2 rpm) climbed from the normal indication of 103 percent to 120 percent, resulting in an overspeed. When the pilot was not able to reduce electrically the excessive turbine speed, he increased the collective to increase torque and attempted to manually control the governor. When this action was also ineffective in reducing the power turbine speed, the pilot elected to enter an autorotation. During touchdown on rolling terrain, the helicopter's main rotor blades flexed downward and severed the tailboom. The pilot, the sole occupant, escaped injury.

The governor, fuel control, fuel pump, and high pressure filter were removed from the Allison 250-C20 turbo-shaft engine and forwarded to a certificated repair station where they were evaluated. The Chandler Evans governor, which had a total time since overhaul of 1,108.9 hours, was disassembled. Metal contamination, consisting of metal filings from the high pressure fuel filter bypass valve seat, were found around the diaphragms in the governor, and score marks were found on the speed weight metering lands. The score marks and the metal contamination indicated that the governor speed weight had seized during operation. Examination of the high pressure filter bypass valve seat showed chatter marks which indicated that the high pressure fuel filter bypass valve had been oscillating and had generated the metal filings. As a result of its evaluation, the Safety Board concluded that the power turbine overspeed resulted from metal contamination, which caused the speed weight to seize.

A review of FAA Service Difficulty Reports on the Chandler Evans governor contained 22 reports of overspeed, 7 of which indicated that the governor had been contaminated. On November 14, 1979, the Detroit Diesel Allison Company issued Commercial Engine Service Bulletin CEB-1144, warning that the high pressure fuel filter bypass valve is subject to wear and should be replaced with kit P/N 6896726; the kit includes a replacement filter element for improved service life. The operator of the accident aircraft had not complied with this service bulletin.

The Safety Board believes that if Service Bulletin CEB-1144 was made mandatory, the occurrence of power turbine overspeed caused by governor malfunctions would be substantially reduced.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Airworthiness Directive to require compliance with the Detroit Diesel Allison Commercial Engine Service Bulletin CEB-1144. (Class II, Priority Action) (A-81-82)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS and GOLDMAN, Members, concurred in this recommendation. BURSLEY, Member, did not participate.

James B King

By: James B. King
Chairman

US Department
of Transportation

**Federal Aviation
Administration**

September 11, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-81-85 through A-81-87 issued by the Board on August 7, 1981. These recommendations resulted from the Board's investigation of the crash of a Varga Model 2150A, N8423J, at Stevensville, Maryland, on July 31, 1981. In this accident, elevator control was lost because of failure of the elevator horn assembly (P/N VAC 6000K-26). Both persons aboard the aircraft were killed.

A-81-85. Issue an emergency Airworthiness Directive to require that all P/N VAC 6000K-26 elevator horn assemblies installed on Varga aircraft be inspected before further flight and thereafter at appropriate time intervals. Horn assemblies should be removed from the aircraft and the mounting flange areas stripped of paint. The upper aft corners of the channel bends and the mounting radii should then be inspected by an appropriate nondestructive test method. Horn assemblies found cracked should be removed from service.

FAA Comment. The FAA concurs in this recommendation and a copy of Emergency Airworthiness Directive 81-17-05, issued by priority mail on August 13, 1981, is enclosed. This AD requires an inspection of the elevator for integrity and, if found to be cracked, replacement with improved parts. It also requires repetitive checks prior to each flight for a period not to exceed 10 additional hours' time in service, at which time the (steel) improved part is to be installed and the repetitive inspections required by the AD may be discontinued. AD 81-17-05 supersedes AD 79-15-06. The FAA considers action completed on Safety Recommendation A-81-85.

A-81-86. Issue an Airworthiness Directive to require that the flange area on all P/N VAC 6000K-26 elevator horn assemblies installed on Varga aircraft be visually inspected before each flight for cracking in the upper aft corners of the channel bends and in the mounting flange radius areas. Horn assemblies found cracked should be removed from service.

FAA Comment. AD 81-17-05, discussed in our response to Safety Recommendation A-81-85, is fully responsive to, and satisfies the intent of, this recommendation. Accordingly, the FAA considers action completed on Safety Recommendation A-81-86.

A-81-87. Evaluate the design of the P/N VAC 6000K-26 elevator horn assembly and the manner in which it is attached to the elevator.

FAA Comment. The FAA concurs in this recommendation. The P/N VAC 6000K-26 elevator horn assembly will be removed from service and replaced with an improved steel part within 10 hours' additional time in service from the (immediate) effectivity of AD 81-17-05, issued August 13, 1981. This action is fully responsive to Safety Recommendation A-81-87 and, accordingly, the FAA considers action completed on this recommendation.

Sincerely,

Helms

J. Lynn Helms
Administrator

Enclosure

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 7, 1981

Forwarded to:
Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20594

SAFETY RECOMMENDATION(S)

A-81-85 through -87

On July 31, 1981, a Varga Model 2150A, N8423J, crashed near Bay Bridge Industrial Airport, Stevensville, Maryland, after control of the elevator was lost because of failure of the elevator horn assembly (P/N VAC 6000K-26). Both persons aboard the aircraft were killed.

Metallurgical examination of the elevator horn assembly revealed that the failure was a result of fatigue cracking in the mounting flanges of the horn. The fatigue initiated from multiple origins in the flange radius and propagated through approximately 75 percent of the right flange and 90 percent of the left flange before final separation. Although small portions of the fracture contained characteristics typical of high cycle, low stress fatigue cracking, most of the fatigue appeared to have propagated under relatively high loads. This indicates that the elevator horn assembly could have failed a short time after crack initiation.

Two smaller, secondary fatigue cracks were found in the top of the elevator horn assembly near the mounting flanges. These cracks initiated from near the aft edge of the horn where the channel is wrapped around the shim. The longer of these cracks extended approximately 3/8 inch forward from its initiation area.

Removal of the paint layers from the flange area of the failed horn revealed multiple scratches in the metal. The alignment of these scratches indicates that the fatigue origin area had been sanded or perhaps filed.

A metallurgical examination was also conducted on five additional elevator horn assemblies from the following Varga model 2150A aircraft: N4638V, N4642V, N4617V, N4614V, and N4630V. Paint cracking in the flange radius areas was found on all of these horns except the horn from N4617V which was not painted. In addition, the horns from N4630V and N4642V contained fatigue cracks similar to the secondary fatigue cracks found on the accident aircraft horn.

3322

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an emergency Airworthiness Directive to require that all P/N VAC 6000K-26 elevator horn assemblies installed on Varga aircraft be inspected before further flight and thereafter at appropriate time intervals. Horn assemblies should be removed from the aircraft and the mounting flange areas stripped of paint. The upper aft corners of the channel bends and the mounting radii should then be inspected by an appropriate nondestructive test method. Horn assemblies found cracked should be removed from service. (Class I, Urgent Action) (A-81-85)
>
> Issue an Airworthiness Directive to require that the flange area on all P/N VAC 6000K-26 elevator horn assemblies installed on Varga aircraft be visually inspected before each flight for cracking in the upper aft corners of the channel bends and in the mounting flange radius areas. Horn assemblies found cracked should be removed from service. (Class I, Urgent Action) (A-81-86)
>
> Evaluate the design of the P/N VAC 6000K-26 elevator horn assembly and the manner in which it is attached to the elevator. (Class II, Priority Action) (A-81-87)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS and BURSLEY, Members, concurred in these recommendations. GOLDMAN, Member, did not participate.

By: James B. King
Chairman

for

US Department of Transportation
Federal Aviation Administration

Office of the Administrator

800 Independence Ave. S.W.
Washington, D.C. 20591

July 1, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendations A-80-64 through A-80-75 issued August 8, 1980, and supplements our letter of November 6, 1980. This also responds to your letter of March 20, 1981, in which you requested a further response to those recommendations still classified in an "Open" status. These recommendations resulted from the Board's special investigation of the commuter airline industry and the elements which affect airline safety. As a result of this study, the NTSB reiterated five previously issued recommendations to the Federal Aviation Administration (FAA). The Board has been advised of actions underway with respect to these recommendations, most recently in our letter of November 6. Therefore, further response to Safety Recommendations A-79-80 and -81, and A-78-27 through -29 will be addressed by separate correspondence. In your March 20 letter, Safety Recommendations A-80-64, -65, -66, -69, -72, and -73 are classified in a "Closed—Acceptable Action" status. Accordingly, this letter addresses Safety Recommendations A-80-67, -68, -70, -71, -74, and -75.

A-80-67. Establish a procedure for distributing surveillance of commuter airline maintenance evenly during all periods when maintenance is performed.

FAA Comment. With the recertification workload behind us, normal surveillance provides the district office supervisor the indicators needed to distribute efficiently the district office work force. This provides the means to monitor adequately the commuter airlines maintenance programs. The FAA considers action on this recommendation completed for reasons cited in our letter of November 6. We find that surveillance is adequate and no further inspector personnel assignments are planned.

A-80-68. Require that only actual passenger weights be used in weight and balance computations for reciprocative engine aircraft used in Part 135 flights which are certificated for nine or less passengers.

FAA Comment. Change 6, amended Chapter 3, Section 8 to Order 8320.12, incorporated instructions to FAA inspectors that deal specifically with weight and balance control of FAR 135 operators of aircraft certified for nine or less passengers. These instructions contain additional criteria that must be

met when approving a weight and balance control program for these operators. We believe these changes, the revision to Advisory Circular 120-27A, coupled with previous notices concerning FAR 135 weight and balance, satisfy the intent of this recommendation obviating the need for rulemaking to amend FAR 135. Accordingly, the FAA intends to take no further action on Safety Recommendation A-80-68.

A-80-70. Amend 14 CFR 135 Subpart B to require that dispatch and flight operations duties are supervised by personnel trained in those functions.

FAA Comment. The FAA continues to believe that there are sufficient provisions, both in 14 CFR Part 135 and Order 8430.1B, to ensure adequate operational control. Items such as flight planning so as to avoid adverse weather conditions, ensuring proper weight and balance conditions, and adequate aircraft preflights are the ultimate responsibilities of the pilot in command. The Board's response of March 20 states that your intent is not to require a dispatch function as required in Part 121. The responsibility for the conduct of a safe flight rests with the pilot in command, including certain functions related to preflight and operations within aircraft weight and center of gravity limitations. Your response seems to imply that there is a need for a less specific division of responsibility or duties. The FAA cannot subscribe to any division of duty which would diminish that which is both inherent and circumscribed by regulation.

We therefore believe the pilot training program provisions specified in Appendix 1 of Order 8430.1B are wholly sufficient in that there are extensive provisions for pilot training in the subject areas. We will continue to monitor the training program provisions and, should future operational problems dictate, strengthen these provisions as required. In the interim, we consider action completed on Safety Recommendation A-80-70.

A-80-71. Amend 14 CFR 135.185 to require that aircraft empty weight and center of gravity be determined more frequently.

FAA Comment. Our comments in response to Safety Recommendation A-80-68 also apply to this recommendation. We continue to believe that issuance of Advisory Circular 120-27A is adequate to satisfy the intent of this recommendation obviating the need for rulemaking to amend FAR 135. Accordingly, the FAA considers action on Safety Recommendation A-80-71 completed.

A-80-74. Revise the qualifying criteria to insure that a larger percentage of commuter-served airports are equipped with instrument landing systems.

FAA Comment. In our letter of November 6, we advised that the FAA had initiated an extensive evaluation of the instrument landing system (ILS) qualifying criteria. Our evaluation of ILS establishment criteria revealed that 99.5 percent of air carrier enplanements occur at airports that have ILS's installed or programmed. The coverage for commuter passengers is

87.9 percent. To correct this imbalance, we applied special criteria to commuter airports which will result in their coverage increasing to 94.3 percent. The Board previously informed the FAA that this recommendation is classified in an "Open--Acceptable Action" status. We believe that FAA's commuter airport program is fully responsive to the Board's concerns, and with this corrective measure, we consider action completed on Safety Recommendation A-80-74.

A-80-75. Insure, to the extent possible, that airports which are served by commuter airlines are equipped with an instrument approach facility.

FAA Comment. We advised in our November 6 letter that the FAA had initiated an analysis of all airports served by commuter airlines in the continental U.S. and Hawaii. We have now developed a Commuter Airport Program that includes precision approach aids and other landing aids. When this five-year program is completed, we estimate that more than 94 percent of commuter airline passengers and 99.6 percent of all commercial airline passengers would be served by airports with precision approach equipment. A copy of the press release describing the Commuter Airport Program is enclosed for your information. The Board previously informed the FAA that this recommendation is classified in an "Open--Acceptable Action" status. With the implementation of this program, the FAA considers action completed on Safety Recommendation A-80-75.

Sincerely,

J. Lynn Helms
Administrator

Enclosure

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

MAR 20 1981

Mr. Charles A. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Weithoner:

Thank you for the Federal Aviation Administration letter of November 6, 1980, responding to National Transportation Safety Board Safety Recommendations pertaining to commuter airline operations issued August 8, 1980. This letter is in reply to the Federal Aviation Administration's (FAA) response to Safety Recommendations A-80-64 through -75. The FAA's response to our reiteration of Safety Recommendations A-79-80 and -81 and A-78-27 through -29 will be answered in separate letters.

In Safety Recommendation A-80-64 we asked the FAA to establish a separate classification of commuter airline inspectors to conduct commuter airline surveillance. We are pleased to be informed that the FAA established a separate classification guide for Principal Aviation Safety Inspectors. The intent of A-80-64 is satisfied and its status classified "Closed--Acceptable Action."

In Safety Recommendation A-80-65 we proposed that the FAA provide specialized training for inspectors assigned to commuter airlines to insure that inspectors are qualified in the equipment operated and are knowledgeable regarding commuter airline operations. We have reviewed the FAA's selection standards and continuing training programs for commuter airline inspectors. We are satisfied with the implementation of this recommendation which is classified "Closed--Acceptable Action."

In Safety Recommendation A-80-66 we asked the FAA to allocate General Aviation District Office resources to insure that all commuter surveillance and general aviation requirements are accomplished. We are pleased to be informed that the FAA has established 127 inspector positions in the FY 1980 and FY 1981 budgets specifically for commuter/ air taxi certification and surveillance activities. The status of A-80-66 is classified as "Closed--Acceptable Action."

In Safety Recommendation A-80-67 we requested the FAA to establish a procedure for distributing surveillance of commuter airline maintenance evenly during all periods when maintenance is performed. We are pleased to note that the FAA agrees with this recommendation. Now that operators have been recertificated under the new Part 135 and newly hired inspectors are being trained and placed in position, we find the FAA better equipped to schedule off-hour surveillance of commuter maintenance. We appreciate the FAA's offer to keep the Safety Board advised on the progress of this recommendation which we are maintaining in an "Open-Acceptable Action" status.

In Safety Recommendation A-80-68 we recommended that the FAA require that only actual passenger weights be used in weight and balance computations for reciprocating engine aircraft used in Part 135 flights which are certificated for nine or less passengers. Notwithstanding the FAA's internal notices on the subject of aircraft weight and balance and Advisory Circular, AC 120-27A, on Weight and Balance Control dated May 14, 1980, commuter airline accidents attributed to aircraft being overloaded and out of balance are continuing. The Board appreciates the actions taken; however, pending FAA's further action to require the use of actual passenger weights, this recommendation will be maintained in an "Open--Acceptable Action" status.

In Safety Recommendation A-80-69 we proposed that the FAA amend Section 135.243 to require a minimum number of multiengine flight hours for a pilot-in-command of a multiengine commuter airline flight. We note that the new Section 135.244 requires increased operational experience by make and model for both single and multiengine aircraft. Also, Subpart H of Part 135 requires more stringent ground and flight training. The status of A-80-69 is classified as "Closed--Acceptable Alternate Action."

In Safety Recommendation A-80-70 we asked the FAA to amend 14 CFR 135 Subpart B to require that dispatch and flight operations duties are supervised by personnel trained in those functions. We have examined Federal Aviation Regulations Sections 135.37, 135.39, and 135.77. We believe the staffing and qualifications for management and supervisory personnel to be adequate and well documented. However, our concern is that flights continue to be undertaken in unsafe conditions. We do not recommend a flight dispatcher as required in Part 121 operations. However, there is a need for positive control and responsibility on the ground to prevent a pilot taking off in an unairworthy aircraft, or in adverse weather conditions, or in an aircraft overloaded and out of balance. In view of the foregoing, we believe that personnel involved in the preflight planning aspects of a flight should receive formal training and that this training should be specified in Part 135. Safety Recommendation A-80-70 is being held in an "Open--Unacceptable Action" status pending the FAA's reconsideration of this recommendation.

In Safety Recommendation A-80-71 we asked the FAA to amend Section 135.185 to require that aircraft empty weight and center of gravity be determined more frequently. Your response that Advisory Circular 120-27A on Weight and Balance Control dated May 18, 1980, satisfies this recommendation is not acceptable. Our investigation of accidents involving aircraft weight and balance has been made difficult by the absence of such data. We have no objection to a cumulative weight control system as the primary means of controlling operating weight and center of gravity. However, we request the FAA to proceed beyond the advisory stage and require some positive action to meet the intent of this recommendation. Pending the FAA's further reconsideration, A-80-71 is classified as "Open--Unacceptable Action."

In Safety Recommendation A-80-72 we requested the FAA to evaluate and revise as appropriate the criteria for the authorization of single-pilot IFR operations for commuter airlines. The requirements of Section 135.105, effective March 1, 1980, are positive measures to upgrade safety standards. This recommendation is, therefore, classified in a "Closed--Acceptable Action" status.

In Safety Recommendation A-80-73 we proposed the expansion of the Airport Development Aid Program to support the development of commuter-served airports. We are pleased to learn of the many actions taken and ongoing by the FAA to administer and support the development of commuter-served airports. This recommendation is also classified in a "Closed--Acceptable Action" status.

Safety Recommendation A-80-74 called upon the FAA to revise the qualifying criteria to insure that a larger percentage of commuter-served airports are equipped with instrument landing systems. Since the FAA is evaluating this recommendation and will advise the Safety Board of its findings, its status is classified as "Open--Acceptable Action."

In Safety Recommendation A-80-75 we asked the FAA to insure, to the extent possible, that airports which are served by commuter airlines are equipped with an instrument approach facility. We note that 64 percent of these airports already have or are programmed to have instrument landing systems and that the needs of other commuter-served airports are being examined. Pending the FAA's further response, A-80-75 is classified in an "Open--Acceptable Action" status.

Briefly, our records on the status of the above recommendations show:

A-80-64	Closed--Acceptable Action
A-80-65	Closed--Acceptable Action
A-80-66	Closed--Acceptable Action

A-80-67 Open--Acceptable Action
A-80-68 Open--Acceptable Action
A-80-69 Closed--Acceptable Alternate Action
A-80-70 Open--Unacceptable Action
A-80-71 Open--Unacceptable Action
A-80-72 Closed--Acceptable Action
A-80-73 Closed--Acceptable Action
A-80-74 Open--Acceptable Action
A-80-75 Open--Acceptable Action

We thank the FAA for actions taken and ongoing and request a further response to the recommendations we have classified in an open status.

Sincerely yours,

James B. King
Chairman

X

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF THE ADMINISTRATOR

November 6, 1980

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations, relating to Commuter Airline operations, issued by the Board on August 8, 1980. These recommendations resulted from the Board's special investigation of the commuter industry and the elements which affect commuter airline safety. The objectives of these recommendations, for the most part, were within the scope of existing FAA programs.

As a result of its study, the National Transportation Safety Board reiterated five previously issued recommendations to the Federal Aviation Administration. The Board had been earlier advised of actions underway with respect to these recommendations. Many of these actions were developed as the result of the implementation and the issuance of amendments to Part 135 of the FAR's published at various times during calendar year 1980, or as the resolution of issues or concerns discussed during the FAA's First Commuter Air Carrier Safety Symposium held January 16 and 17, 1980. The adequacy of these actions, and other regional programs directed to commuter safety, will again be addressed at the second symposium to be held January 16 and 17, 1981. The current status of these actions is as follows:

A-79-80. Require that pilots involved in 14 CFR 135 operations be thoroughly trained on the performance capabilities and handling qualities of aircraft when loaded to their maximum certificated gross weight or to the limits of their c.g. envelope, or both.

Comment. As stated in our letter to the NTSB dated August 27, 1980, regulatory action was deemed appropriate, and, in fact, has been accomplished by the issuance of new FAR Section 135.244, Operating Experience, effective March 1, 1980. We believe the addition of this

requirement will further ensure that pilots involved in commuter operations are adequately trained in all pertinent operational areas, one of which includes aircraft handling characteristics at maximum takeoff gross weights. The FAA considers action on Safety Recommendation A-79-80 completed.

A-79-81. Expedite rulemaking which would make the flight time and duty time limitations, and rest requirements for commuter air carriers the same as those specified for domestic air crewmembers under 14 CFR 121.

Comment. Work on this project is continuing. A supplemental notice of proposed rule making was issued on August 11, 1980, (Notice No. 78-3B, copy enclosed). This supplemental notice proposes to revise the flight and duty time limitations and rest requirements for flight crewmembers utilized by domestic, flag, and supplemental air carriers, commercial operators, and air taxi operators. This supplemental notice is based upon two notices of proposed rule making issued in 1977 and 1978 as part of the FAA's Regulatory Review Program.

Preliminary FAA analysis of the comments received on the earlier notices (and specifically Notice 78-3) indicated the need for intensive review and additional conceptual development before that rulemaking action could proceed. Consequently, in view of the conceptual similarity between the flight and duty time limitations proposed in Part 135 and the proposal in Notice 78-3, when the agency issued the amendments to Part 135, it was decided to defer changing the flight and duty time limitations in Part 135 until they could be given further consideration. Accordingly, this supplemental notice proposes changes to both Part 121 and Part 135 and includes a discussion of comments received in response to Notices 78-3 and 77-17 pertaining to flight and duty time limitations.

A-78-27. Develop, in cooperation with industry, flight recorder standards (FDR/CVR) for complex aircraft which are predicated upon intended aircraft usage.

Comment. We recently updated the status of this safety recommendation in our letter of July 29, 1980. To reiterate our remarks, during August 1979 FAA received a proposed standard for a composite cockpit voice recorder/flight data recorder (CVR/FDR) from one of the major manufacturers of both CVR's and FDR's. Working with this proposed standard and other sample standards as a base, FAA has developed a proposed draft standard for a composite CVR/FDR. A new public procedure to expedite the issuance of standards for specified materials, parts, processes, and appliances used on civil aircraft was issued by FAA on June 2, 1980, with September 9 as its effective date (copy enclosed). FAA will publish its proposed standard for a composite CVR/FDR under this new procedure. A copy of the latest draft of the CVR/FDR and a copy of

draft of the CVR/FDR Standard and a copy of the new TSO procedures are enclosed. As a result of a recent NTSB recommendation, FAA is requesting SAE to develop the standard from our draft material.

A-78-28. Draft specifications and fund research and development for a low cost FDR, CVR, and composite recorder which can be used on complex general aviation aircraft. Establish guidelines for these recorders, such as maximum cost, compatible with the cost of the airplane on which they will be installed and with the use for which the airplane is intended.

Comment. The status of this recommendation was also updated in our letter of July 29, 1980. Although initially the FAA had planned to establish a regulatory project to develop an Advance Notice of Proposed Rule Making (ANPRM) for identification of appropriate standards, further review of the matter indicated that this regulatory procedure was not necessary. Research and development previously accomplished by the U.S. Army and by NASA was already being incorporated by several equipment manufacturers in their own development plans.

A-78-29. In the interim, amend 14 CFR to require that no operation (except for maintenance ferry flights) may be conducted with turbine-powered aircraft certificated to carry six passengers or more, which require two pilots by their certificate, without an operable CVR capable of retaining at least 10 minutes of intracockpit conversation when power is interrupted. Such requirements can be met with available equipment to facilitate rapid implementation of this requirement.

Comment. We also updated the status of this recommendation in our July 29, 1980, letter as follows: "In partial fulfillment of this recommendation, 14 CFR 135 was amended, as published October 10, 1978, in Vol. 43 FR 46742, to require under Section 135.151 (copy enclosed) that no person may operate a turbojet airplane having a passenger seating configuration, excluding any pilot seat, of 10 seats or more, unless it is equipped with an approved cockpit voice recorder.

"In further fulfillment of this recommendation, the FAA currently is drafting an NPRM which would require under Part 91, General Operating and Flight Rules, several additional equipment items, including a CVR on all multiengine turbojet airplanes. This would expand the coverage under Section 135.151 since there would be no minimum seating requirement specified." The FAA will continue to keep the Board advised of progress relating to these recommendations.

In addition to reiterating these five recommendations, the Board made twelve additional recommendations. The Board was previously advised that the FAA had initiated or completed actions which satisfied the intent of several of these safety recommendations.

A-80-64. Establish a separate classification of commuter airline inspectors to conduct commuter airline surveillance.

Comment. A separate classification was established within the FAA GS-1825 classification guide well in advance of the issuance of this recommendation. This classification for Principal Aviation Safety Inspectors emphasizes experience requirements for the certification and surveillance of commuter airlines. This guide is currently being used in the job classification of these inspectors. (A copy of the applicable announcements are enclosed.) We consider action on Safety Recommendation A-80-64 completed.

A-80-65. Provide specialized training for inspectors assigned to commuter airlines to insure that inspectors are qualified in the equipment operated and are knowledgeable regarding commuter airline operations.

Comment. The FAA agrees with this recommendation and has initiated additional training courses for this purpose. Specialized training is being provided for inspectors assigned to commuter airlines at the Mike Monroney Aeronautical Center at Oklahoma City. Course 21618, Air Carrier Airworthiness Indoctrination (ACAI), is for general aviation inspectors and is made up of selected subjects from the air carrier inspectors indoctrination course. It was initiated in FY-79 in response to revised Part 135. Eighty inspectors completed this course in FY-79/80 and 16 inspectors are scheduled for FY-81. The second, Course 21828, Air Taxi Certification and Surveillance, covers certification requirements, operating rules, aircraft, equipment, policies, and procedures. This course was developed for airworthiness inspectors assigned to commuter airlines. In FY-79/80, the FAA trained 48 inspectors in Course 21828 and 36 inspectors are scheduled for FY-81. There are two courses for operational inspectors: Course 22100, Air Taxi Operations Certification and Inspection; and Course 21617, Air Carrier Mini Indoctrination. One hundred and seventy inspectors completed Course 22100 in FY-79/80 and 40 inspectors completed Course 21617 in FY-80 (the first year that this course was offered). For FY-81, Course 22100 has 70 inspectors scheduled for attendance and Course 21617 has 36 inspectors scheduled. With regard to flight training and qualifications, a continuing effort is being made to qualify all commuter inspectors in at least one turboprop aircraft and, where applicable, specific turbojet aircraft under their surveillance. This should be viewed as a continuing program due to such factors as manpower and fiscal restraints and personnel turnover. The FAA considers action on Safety Recommendation A-80-65 completed.

A-80-66. Allocate GADO resources to insure that all commuter surveillance and general aviation requirements can be accomplished.

Comment. 127 Flight Standards Aviation Safety Inspector positions were allocated for the FY 1981 budget appropriation. Due to a pressing need, 50 of these positions were advanced to the FY 1980 budget, and these positions have all been filled. The additional 77 positions will be filled during FY 1981. All of the 127 positions are dedicated to commuter/air taxi certification and surveillance activities. The FAA considers action on Safety Recommendation A-80-66 completed.

A-80-67. Establish a procedure for distributing surveillance of commuter airline maintenance evenly during all periods when maintenance is performed.

Comment. The FAA is in agreement with the intent of this recommendation and we believe it will be satisfied by events in progress. Work assignments for inspectors is a function of district office supervision, which provides the greatest flexibility for effective utilization of those personnel. The headquarters and regional offices periodically emphasize the need for specific surveillance by notices, such as N 8000.198, Increased Surveillance for Operator Under New Part 135 (copy enclosed).

Inspector personnel assigned to commuters have borne a time-consuming workload in the recertification of those operators under the new Part 135. With this workload behind us and hiring of new inspectors for commuter assignments now in progress, coupled with the commuter-oriented inspector programs, sufficient inspector manpower should be provided to accommodate scheduling off-hour surveillance of commuter maintenance activities. We will keep the Board advised of the results of our efforts in this regard.

A-80-68. Require that only actual passenger weights be used in weight and balance computations for reciprocative engine aircraft used in Part 135 flights which are certificated for nine or less passengers.

Comment. This was accomplished on an interim basis by internal notices culminating April 1, 1980. Final implementation of this recommendation is by Advisory Circular, AC 120-27A, Weight and Balance Control, issued May 14, 1980, and by internal instructions to FAA airworthiness inspectors, which are under development. The thrust of FAA's efforts in this area is to cause the certificate holders to develop suitable weight and balance control systems that can be easily managed by pilots or other personnel responsible for loading, in accordance with methods and procedures provided by the respective certificate holder. The FAA considers action on Safety Recommendation A-80-68 completed.

A-80-69. Amend 14 CFR 135.243 to require a minimum number of multiengine flight hours for a pilot-in-command of a multiengine commuter airline flight.

Comment. In February 1980, new Section 135.244, commuter pilot-in-command operating experience requirements, was issued, which contained standards for pilots prior to designation as pilot-in-command on commuter passenger-carrying operations. These requirements established increased operating experience levels by make and model for both single and multiengine aircraft. This experience, which varies depending on whether the aircraft is piston or turbine powered, must be acquired under the supervision of a check airman employed by the certificate holder in passenger-carrying operations. The intent of this rule is to upgrade

pilot experience to adhere to a higher level of safety. A copy of this new section is enclosed for your review. Also, it should be stressed that this new section specifies requirements in addition to those in Section 135.243, which require all pilots serving in commuter operations to hold an airline transport pilot certificate. This requirement in itself, in our judgment, contributes appreciably to pilot-in-command experience, especially when complemented by the provisions of new Section 135.244. Finally, we believe the increased training program requirements contained in Subpart H of Part 135 are also a positive factor. In this regard, the operating experience under Sections 135.244 must be acquired only after satisfactory completion of the appropriate ground and flight training for the aircraft and crewmember position. Approval provisions for the operating experience must be scheduled in the operator's training program. We consider action on Safety Recommendation A-80-69 completed.

A-80-70. Amend 14 CFR Subpart B to require that dispatch and flight operations duties are supervised by personnel trained in those functions.

Comment. Due to the relative size and scope of Part 135 commuter operations, we do not, at this time, believe there is a need for a flight dispatcher as indicated in Part 121 operations. We will, of course, continue to monitor this situation for possible changes in future operations. With regard to flight operating personnel qualifications and training, we believe the current regulations are adequate. The qualification requirements for supervisory personnel are adequate to achieve the intended level of safety. Section 135.37, Management Personnel Required, requires a qualified director of operations, chief pilot, and director of maintenance. Section 135.39 specifies the qualifications that persons occupying these positions must possess. Also, Section 135.77, Responsibility for Operational Control, requires each certificate holder to list in his operating manual the name and title of each person authorized to exercise operational control. Accordingly, the FAA intends to take no further steps in this area at this time, and we consider action on Safety Recommendation A-80-70 completed.

A-80-71. Amend CFR 135.185 to require that aircraft empty weight, and that center of gravity be determined more frequently.

Comment. The FAA agrees with the intent of this proposal as it regards the importance of aircraft empty weight, operating weight, and corresponding centers of gravity (c.g.). However, we believe a well developed cumulative weight control system is the primary means of controlling operating weight and c.g. This system continuously updates operating weights and c.g.'s (or other aircraft weight references) to account for changes to the aircraft, its equipment, or standard passenger provisions such as stewardess supplies. Periodic reweighing of aircraft under

approved programs serves to confirm the cumulative weight control system. Section 185 provides for the use of approved weight and balance control systems for multiengine aircraft which includes cumulative weight control. These programs include periodic reweighing requirements for aircraft controlled on a fleet basis, as well as aircraft handled individually. In the case of aircraft fleets, aircraft within each fleet are weighed on a sampling basis to confirm the fleet weight and c.g. Therefore, reweighing periodically is imposed on the fleet rather than on individual aircraft.

Advisory Circular 120-27A, Weight and Balance Control, was issued May 18. This circular consolidates previous advisory circulars for air taxis and large air carriers, and includes cumulative weight control procedures as well as aircraft reweigh periods. The superseded advisory circular for air taxis did not include a periodic reweigh period. We do not believe further steps in this area are appropriate at this time and, accordingly, the FAA considers action on Safety Recommendation A-80-71 completed.

A-80-72. Evaluate and revise as appropriate the criteria for the authorization of single-pilot IFR operations for commuter airlines.

Comment. The FAA concurs with Safety Recommendation A-80-72. Section 135.105 was amended, effective March 1, 1980, to require that, prior to authorizing single pilot IFR operations, the pilot-in-command must have previously logged 100 pilot-in-command hours in the make and model aircraft to be flown. This increased pilot experience requirement would ensure that the pilot has aircraft familiarity and proficiency sufficient to adequately cope with IFR operational problems and to handle inflight emergencies. We consider action on Safety Recommendation A-80-72 completed.

A-80-73. Expand the ADAP program to support the development of commuter-served airports.

Comment. In 1976, Amendments to the Airport and Airway Development Act of 1970 defined commuter airports for the first time and provided specific funding for their development. In the administration of the Airport Development Aid Program (ADAP), the FAA, through use of an authorized discretionary fund, has consistently granted more for commuter airport development annually than the $15 million identified in the Act for use at commuter locations (FY 1976, $19.9M; FY 1977, $23.9M; FY 1978, $19.9M; FY 1979, $30.7M; and FY 1980, $21.6M).

The Administration's legislative proposal to continue an airport grant program beyond the September 30, 1980, expiration of the ADAP was developed to provide a single fund for development of all commercial service (including commuter) airports. This will allow greater emphasis to be placed on improvement of commuter airports in the post-1980

program. The latest House and Senate legislative proposals require administration of the facilities and equipment and airport development programs in a manner to maximize the use of safety facilities with highest priority for commercial service airports. This includes, but is not limited to, installation, operation, and maintenance of precision approach systems for each primary runway; grooving or friction treatment of all primary and secondary runways; nonprecision approaches for secondary runways; and electronic or visual vertical guidance on all runways.

We believe the FAA's ADAP program has been administered to support the development of commuter-served airports, and that future programs though subject to legislative approval, have also been designed to support commuter airports, and, accordingly, no further action is presently intended. The FAA, therefore, considers action on Safety Recommendation A-80-73 completed.

A-80-74. Revise the qualifying criteria to insure that a larger percentage of commuter-served airports are equipped with instrument landing systems.

Comment. An extensive evaluation of the instrument landing system (ILS) qualifying criteria was initiated. This evaluation includes a reassessment of the benefits derived from an ILS by all categories of aviation, including trunk carriers, commuter carriers, air taxi carriers, general aviation, and military. Completion of this evaluation is anticipated in the near future. We will advise the Board of the results of this evaluation as soon as they are available.

A-80-75. Insure, to the extent possible, that airports which are served by commuter airlines are equipped with an instrument approach facility.

Comment. In February 1980 the FAA initiated an indepth analysis of all airports served by commuter airlines in the continental U.S. and Hawaii which found that 64 percent have a commissioned or programmed instrument landing system (ILS). Commuter needs at the remaining commuter-served airports are being investigated. Recommendations regarding the installation of ILSs at specific airports are anticipated in the near future and will be made available to the Board when available.

In summary, the FAA considers action completed on Safety Recommendations A-80-64, -65, -66, and -68 through -73. We intend to provide further response to the Board on Recommendations A-80-67, -74, and -75.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

Enclosures

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 8, 1980

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-80-64 through -75

On January 31, 1980, the National Transportation Safety Board completed a 4-day public hearing on commuter airline safety. The hearing followed an extensive 4-month special investigation of the commuter industry and the elements which affect commuter airline safety. The special investigation included an on-site survey of 45 commuter airlines throughout the United States, a study of the role and effectiveness of the Federal Aviation Administration and the Civil Aeronautics Board, the influence of the airport environment, financial posture and management structure on individual airlines and on commuter airline safety, and an evaluation of the operational, maintenance, and training programs of the commuter airline industry. The Safety Board used its 1972 "Air Taxi Safety Study" and its commuter aircraft accident investigation experience as a basis to determine the safety issues which were involved and to evaluate the progress the commuter airline industry and the FAA are making toward correcting the deficiencies.

The Safety Board's study of the FAA's role in the surveillance of the commuter airline industry indicates there is a need for special training of FAA inspectors, to conduct surveillance of commuter airliner. In addition, the staffing levels at FAA offices responsible for commuter airline surveillance and the workload requirements of the individual inspectors generally do not provide for the accomplishment of effective commuter airline surveillance unless other safety-related, general aviation activities are curtailed. The findings concerning FAA workloads were the subject of several Board recommendations in previous years and were an important finding in the recent special investigation and hearing. The Board also received much testimony that the FAA should standardize surveillance procedures so that each region, district office, and inspector has the same interpretation of FAA regulations and procedures. In addition, the Board concluded that procedures should be revised to provide surveillance of maintenance activities during the work shifts when maintenance is performed. For example, there were indications that very little maintenance surveillance was conducted during the night shifts when the bulk of maintenance activities were performed.

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The Safety Board believes that the revision of 14 CFR 135 has upgraded safety standards for commuter airlines. However, the Board believes that Part 135 should be amended to strengthen the requirements for the training of pilots, especially for training in emergency procedures, weight and balance, and center of gravity. These safety deficiencies, coupled with a lack of knowledge by some flight operations personnel on dispatch procedures, have contributed to several accidents in recent years. Finally, the Board believes that 14 CFR 135 should be amended to increase the frequency of determining the aircraft empty weight and center of gravity for aircraft used in commuter operations.

In addition to the upgrading of pilot training programs, the Safety Board believes that 14 CFR 135 should be revised to establish a minimum number of multiengine flight hours for a pilot-in-command of a multiengine aircraft used in commuter operations. The Universal Airways accident at Gulfport, Mississippi, on March 1, 1979, and the Comair accident at Cincinnati, Ohio, on October 8, 1979, reinforced the Board's belief that a pilot's inexperience in reciprocating multiengine aircraft can affect performance in emergency situations.

The Board's survey of commuter-served airports revealed that those airports served by certificated route air carriers are better equipped with approach and landing aids. For example, 67 percent of the airports served exclusively by commuter airlines do not have a precision instrument approach facility, while 16 percent of these airports have no instrument approach facility. The Board believes that the safety of the public which travels on commuter airlines requires equivalent levels of service, and that there should not be an appreciable difference in airport facilities. The qualification criteria for instrument approach facilities, approach lights, visual approach slope indicators, and other facilities should be revised to allow commuter-served airports to achieve a level of safety equivalent to those airports served by certificated route air carriers. The Board believes that the funding for many of the commuter airport improvements could come from the Aviation Trust Fund if the ADAP criteria were amended to provide a larger share of the revenues to commuter-served airports.

As a result of its study, the National Transportation Safety Board reiterates the following recommendations to the Federal Aviation Administration:

> Require that pilots involved in 14 CFR 135 operations be thoroughly trained on the performance capabilities and handling qualities of aircraft when loaded to their maximum certificated gross weight or to the limits of their c.g. envelope, or both. (Class II, Priority Action) (A-79-80).
>
> Expedite rulemaking which would make the flight time and duty time limitations, and rest requirements for commuter air carriers the same as those specified for domestic air crewmembers under 14 CFR 121. (Class II, Priority Action) (A-79-81)
>
> Develop, in cooperation with industry, flight recorder standards (FDR/CVR) for complex aircraft which are predicated upon intended aircraft usage. (Class II, Priority Action) (A-78-27)

Draft specifications and fund research and development for a low cost FDR, CVR, and composite recorder which can be used on complex general aviation aircraft. Establish guidelines for these recorders, such as maximum cost, compatible with the cost of the airplane on which they will be installed and with the use for which the airplane is intended. (Class II, Priority Action) (A-78-28)

In the interim, amend 14 CFR to require that no operation (except for maintenance ferry flights) may be conducted with turbine-powered aircraft certificated to carry six passengers or more, which require two pilots by their certificate, without an operable CVR capable of retaining at least 10 minutes of intracockpit conversation when power is interrupted. Such requirements can be met with available equipment to facilitate rapid implementation of this requirement. (Class II, Priority Action) (A-78-29)

In addition, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Establish a separate classification of commuter airline inspectors to conduct commuter airline surveillance. (Class III, Longer Term Action) (A-80-64).

Provide specialized training for inspectors assigned to commuter airlines to insure that inspectors are qualified in the equipment operated and are knowledgeable regarding commuter airline operations. (Class II, Priority Action) (A-80-65).

Allocate GADO resources to insure that all commuter surveillance and general aviation requirements can be accomplished. (Class III, Longer Term Action) (A-80-66).

Establish a procedure for distributing surveillance of commuter airline maintenance evenly during all periods when maintenance is performed. (Class II, Priority Action) (A-80-67).

Require that only actual passenger weights be used in weight and balance computations for reciprocative engine aircraft used in Part 135 flights which are certificated for nine or less passengers. (Class II, Priority Action) (A-80-68).

Amend 14 CFR 135.243 to require a minimum number of multiengine flight hours for a pilot-in-command of a multiengine commuter airline flight. (Class II, Priority Action) (A-80-69).

Amend 14 CFR 135 Subpart B to require that dispatch and flight operations duties are supervised by personnel trained in those functions. (Class II, Priority Action) (A-80-70).

Amend 14 CFR 135.185 to require that aircraft empty weight and center of gravity be determined more frequently. (Class III, Longer Term Action) (A-80-71).

Evaluate and revise as appropriate the criteria for the authorization of single-pilot IFR operations for commuter airlines. (Class III, Longer Term Action) (A-80-72).

Expand the ADAP program to support the development of commuter-served airports. (Class II, Priority Action) (A-80-73).

Revise the qualifying criteria to insure that a larger percentage of commuter-served airports are equipped with instrument landing systems. (Class II, Priority Action) (A-80-74).

Insure, to the extent possible, that airports which are served by commuter airlines are equipped with an instrument approach facility. (Class II, Priority Action) (A-80-75).

KING, Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations. DRIVER, Vice Chairman, did not participate.

Patricia A. Goldman

for

By: James B. King
Chairman

Office of the Chairman

National Transportation Safety Board

Washington, D.C. 20594

September 14, 1981

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Thank you for your letter dated August 12, 1981, providing the National Transportation Safety Board with an updated status report on Safety Recommendations A-77-16 and A-77-17 issued April 20, 1977.

With regard to A-77-16 we are informed that the Federal Aviation Administration (FAA) is considering an amendment to Part 139 which would require the construction of extended safety areas concurrently with the construction of new airports, new runways, and major runway extensions at existing airports. Pending its resolution, this recommendation will be maintained in an "Open--Acceptable Alternate Action" status.

We note from your letter and previous responses to A-77-17 that the FAA has an extensive program underway to retrofit approach light structures with frangible materials as rapidly as resources and priority demands permit. This recommendation is now classified in a "Closed--Acceptable Action" status.

Sincerely yours,

James P. King
Chairman

U.S. Department
of Transportation

**Federal Aviation
Administration**

August 12, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendations A-77-16 and A-77-17 issued April 20, 1977, and supplements our letter of April 17, 1981. This also responds to your letter of May 18, 1981, in which you requested a progress report.

A-77-16. Amend 14 CFR 139.45 to require, after a reasonable date, that extended runway safety area criteria be applied retroactively to all certificated airports. At those airports which cannot meet the full criteria, the extended runway safety area should be as close to the full 1,000-foot length as possible.

FAA Comment. In our initial response to Safety Recommendation A-77-16, we did not concur in the requirement to amend 14 CFR 139.45. The proposed amendment would have required all certificated airports to have extended runway safety areas. The Federal Aviation Administration (FAA) finds such a requirement to be unacceptable due to the unreasonable burden placed on airport operators. The FAA advised the Board that, as an alternative, we are considering proposing an amendment to Part 139 which would require construction of extended safety areas concurrently with construction of new airports, new runways, and major runway extensions at existing airports. The proposal, along with other agency rulemaking projects, is being reviewed under Executive Order 12291 to determine, among other things, whether the potential benefits to society will outweigh the potential costs. The economic analysis must, of necessity, be a thorough one, and we cannot say at this time whether the proposal regarding extended runway safety areas will meet this test. In any event, because of the extensive economic study involved, we anticipate that the proposed comprehensive revision of Part 139 may not be published until late 1982. As you have noted, a change to Advisory Circular (AC) 150/5335-4, placing more emphasis on extended safety areas, was issued on June 11, 1980.

A-77-17. Expedite the retrofit of ALS structures with frangible materials and fittings by allocating additional fundings or by increasing the priority of the existing program so that it can be completed within 3 to 5 years.

FAA Comment. The FAA concurred in this recommendation and in our initial response we informed the Board of ongoing efforts in this area. FAA's Airway Facilities Service (AAF) has an extensive program underway to retrofit ALS structures with frangible materials. Because of monetary constraints, we expressed doubt that the frangible structures program could be completed within a 5-year time frame. We are, however, implementing this program as rapidly as resources allocated by the Congress, and other demands placed on this agency, will allow.

As part of the comprehensive review of Part 139, as referenced in our reply to Recommendation A-77-16, we will clarify the requirement that all objects located in any safety area be on frangible mounted supporting structures. The Board will be informed of significant progress in these areas as our efforts continue.

Sincerely,

J. Lynn Helms
Administrator

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

May 18, 1981

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

This is to acknowledge the Federal Aviation Administration's (FAA) letter of April 17, 1981, responding further to National Transportation Safety Board Safety Recommendation A-77-16 issued April 20, 1977. This is one of two recommendations that stemmed from our investigation of a Texas International Airlines DC-9 accident at the Stapleton International Airport, Denver, Colorado, on November 16, 1976. The aircraft overran the runway during a rejected takeoff. Companion recommendation A-77-17 is presently in an "Open--Acceptable Action" status.

In Safety Recommendation A-77-16 we recommended that the FAA:

> Amend 14 CFR 139.45 to require, after a reasonable date, that extended runway safety area criteria be applied retroactively to all certificated airports. At those airports which cannot meet the full criteria, the extended runway safety area should be as close to the full 1,000-foot length as possible.

We have examined the changes to Advisory Circular 150/5335-4 which were effective June 11, 1980, and note on page 18, paragraph 17, the increased emphasis on extended safety areas. We also note that the FAA is considering an amendment to Federal Aviation Regulation Part 139 which will require extended safety areas for all runways used by air carriers with any proposed major airport construction. Pending such resolution, Safety Recommendation A-77-16 is maintained in an "Open--Acceptable Alternate Action" status.

In Safety Recommendation A-77-17 we requested the FAA to:

> Expedite the retrofit of ALS structures with frangible materials and fittings by allocating additional fundings or by increasing the priority of the existing program so that it can be completed within 3 to 5 years.

We are aware of the FAA's efforts to ensure that all objects in the runway safety areas are constructed with frangible structures. However, in order to evaluate the status of this recommendation and bring the public docket up to date, we would appreciate a progress report.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

April 17, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to Safety Recommendation A-77-16 issued April 20, 1977, and supplements our letter of October 22, 1979. This also responds to your letter of July 28, 1980, in which you requested an updated status report.

A-77-16. Amend 14 CFR 139.45 to require, after a reasonable date, that extended runway safety area criteria be applied retroactively to all certificated airports. At those airports which cannot meet the full criteria, the extended runway safety area should be as close to the full 1,000-foot length as possible.

FAA Comment. The reasons for nonconcurrence in this recommendation were stated in our letter of July 11, 1977. Our position of nonconcurrence with the requiremen to apply safety and extended runway safety area criteria to all certificated airports remains unchanged. We are considering an amendment to FAA Part 139, however, which will require extended safety areas for all runways used by air carriers with any proposed major airport construction. The amendment has not, as yet, been published as a Notice of Proposed Rulemaking (NPRM), and there is no assurance, therefore, that we will proceed with a final rule.

As stated in our letter of October 22, 1979, changes to Advisory Circular (AC) 150/5335-4, Airport Design Standards - Airports Served by Air Carriers - Runway Geometrics, dated July 21, 1975, have been distributed (copy enclosed). Please note that this consolidated reprint incorporates Changes 1 and 2, which were effective June 11, 1980. This AC, although advisory, places more emphasis on extended safety areas. This subject is addressed on page 18, paragraph 17, and recent changes are reflected in subparagraphs a. and b.

Assuming that we publish an NPRM and the comments and our analysis are such that we proceed with final rulemaking, we estimate completion during calendar year 1981. We will inform the Board when rulemaking is completed, or of the reasons why rulemaking has been deemed unnecessary.

Sincerely,

Charles E. Weithoner
Acting Administrator

Enclosure

National Transportation Safety Board

Washington, D.C. 20594

Office of Chairman

July 28, 1980

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to your letter dated October 22, 1979, concerning the status of National Transportation Safety Board Safety Recommendation A-77-16 issued April 20, 1977. This is one of two recommendations that emanated from our investigation of a Texas International Airlines DC-9 accident at the Stapleton International Airport, Denver, Colorado, on November 16, 1976. The aircraft overran the runway during a rejected takeoff. Our recommendation dealt with extended runway safety area criteria.

Your letter indicated that a Notice of Proposed Rule Making to amend FAR Part 139 was scheduled for publication in the Federal Register in late 1979. In order to evaluate the progress of this recommendation and update the public docket, the Safety Board would appreciate an updated status report.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF THE ADMINISTRATOR

October 22, 1979

Honorable James B. King
Chairman
National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D. C. 20591

Dear Mr. Chairman:

This is in response to your letter of July 27 regarding the status of National Transportation Safety Board Recommendation A-77-16:

> "Amend 14 CFR 139.45 to require, after a reasonable date, that extended runway safety area criteria be applied retroactively to all certificated airports. At those airports which cannot meet the full criteria, the extended runway safety area should be as close to the full 1,000-foot length as possible."

Our position of nonconcurrence with the recommendation to require retroactive application of safety and extended runway safety area criteria to all certificated airports, as stated in our letter of July 11, 1977, remains unchanged. The proposed amendment to FAR Part 139 to require extended safety areas at new airports, new runways, and major runway extensions at existing airports has not, as yet, been published as a Notice of Proposed Rule Making (NPRM). The NPRM is scheduled to be completed and ready for publication in the Federal Register in late 1979.

A change to Advisory Circular 150/5335-4 has been prepared and was distributed on March 5. This AC, although advisory, now places more emphasis on extended safety areas.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

National Transportation Safety Board

Washington, D.C. 2059:

Office of the Chairman

July 27, 1979

Honorable Langhorne Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to National Transportation Safety Board recommendation A-77-16 issued April 20, 1977. This is one of two recommendations that stemmed from our investigation of the Trans International Airlines DC-9 accident at the Stapleton International Airport, Denver, Colorado, on November 16, 1976. The aircraft had overrun the runway during a rejected takeoff.

We recommended that the Federal Aviation Administration (FAA):

> Amend 14 CFR 139.45 to require, after a reasonable date, that extended runway safety area criteria be applied retroactively to all certificated airports. At those airports which cannot meet the full criteria, the extended runway safety area should be as close to the full 1,000-foot length as possible.

The FAA's response of July 11, 1977, indicated that an amendment to Part 139 would be proposed to require extended safety areas in order to meet the criteria of Advisory Circular 150/5335-4 where practicable. Our staff advises us that action has been delayed because of other FAA priorities. We would appreciate your advice as to the status of this recommendation.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

December 20, 1977

Honorable Kay Bailey
Acting Chairman, National
Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Miss Bailey:

This is in response to your letter of November 4 expressing the Board's concern that the funding level for the retrofit of approach light system structures with frangible materials and fittings is inadequate and will cause a delay beyond the 3 to 5 year completion date included in safety recommendation A-77-17.

Our original estimate for the completion of the backfit program was $40 million as indicated in your letter. As indicated earlier, we are currently installing a prototype installation in Detroit, Michigan, using the new low-impact resistant structures. Considerable design effort has resulted in a structure that will cause minimal obstruction to aircraft while still maintaining the lights under strong wind, snow, and ice conditions. Additionally, we have found that to provide a clear approach area, we need to relocate the present regulator substations from the clear zone, provide maintainable structures, and minimize interference to electronic aids. These various factors, accompanied by a more detailed assessment of the individual site locations and anticipated future year costs, indicate that the total cost will be $77 million in contrast to the original $40 million estimate. We have currently contracted for value engineering services in an attempt to reduce the unit price of the low-impact resistant structures. We would not expect, however, to be able to reduce cost to the extent of program accomplishment within the original $40 million estimate.

As you are aware, the greatest portion of the facilities and equipment budget for FAA is devoted to various projects for the enhancement of safe and efficient movement of aircraft. We expect to concentrate our efforts in backfitting at airport locations with the highest exposure to

aircraft movements. With the current estimated cost, we feel that it will be difficult to accomplish the entire task within the desired 5-year time frame. With our efforts to reduce the unit installation cost and provide an emphasis for this program, we will endeavor to complete the major portion of it within the 5-year time frame, and the remainder in as short a time frame as possible thereafter.

Sincerely,

Quentin S. Taylor
Deputy Administrator

National Transportation Safety Board

Washington, D.C. 20594

Office of Chairman

November 4, 1977

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D. C. 20591

Dear Mr. Bond:

We have received your response to our safety recommendation A-77-17, which resulted from the Texas International accident at Stapleton International Airport, Denver, Colorado, on November 16, 1976.

The National Transportation Safety Board recognizes that funding for the retrofit of approach light system structures with frangible materials and fittings is contingent on the allocation of resources by Congress. However, we are aware that while the estimated cost of this program is about $40 million, to date $5.2 million and $3.9 million have been allocated for FY-77 and 78 respectively, and the budget request for FY-79 is $6 million. Based upon these amounts, and barring any reduction in the current level of funding, it appears that the completion date for the retrofit program necessarily is 7 to 9 years away.

The intent of our recommendation was to expedite the current ALS retrofit program, in order to complete the program within 3 to 5 years. We do not believe the current level of funding will accomplish this objective. In your response to the recommendation you stated that you are ... "fully cognizant of the importance of frangibility in ALS support structures to improve survivability in aircraft accidents in the vicinity of runway ends." In spite of the importance assigned to this program, we believe that it carries a low priority considering the projected completion date. We urge you to take action which will increase the priority and funding allocation of this program to meet a 3 to 5 year completion date.

Sincerely yours,

Francis H. McAdams

for Kay Bailey
Acting Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF THE ADMINISTRATOR

July 11, 1977

Honorable Webster B. Todd, Jr.
Chairman, National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to the National Transportation Safety Board (NTSB) recommendations resulting from the Texas International accident at Stapleton International Airport, Denver, Colorado. The following comments and actions to the recommendations are provided:

A-77-16: Amend 14 CFR 139.45 to require, after a reasonable date, that extended runway safety area criteria be applied retroactively to all certificated airports. At those airports which cannot meet the full criteria, the extended runway safety area should be as close to the full 1,000-foot length as possible.

NONCONCUR: Advisory Circular 150/5335-4 provides the criteria for runway geometric design for airports served by certificated route air carriers. The design guidance contained in this Advisory Circular is intended for new airports and is applicable to existing airports to the extent practical and feasible. Extended safety areas at all existing certificated airports would be impractical and infeasible from the standpoint of placing an unreasonable economic burden on the airport operators.

We will propose an amendment to Part 139 that will require extended safety areas concurrently with construction of new airports, new runways, and major runway extensions at existing airports. The establishment of full extended safety areas (200-foot runway safety area and 800-foot extended safety area), or any portion thereof, would be contingent upon the geography of the airport and the availability of airport property. The target date for submitting a project report for developing a Notice of Proposed Rulemaking (NPRM) to announce this proposal is December 1977.

A-77-17: Expedite the retrofit of ALS structures with frangible materials and fittings by allocating additional fundings or by increasing the priority of the existing program so that it can be completed within three to five years.

<u>CONCUR:</u> The FAA is fully cognizant of the importance of frangibility in ALS support structures to improve survivability in aircraft accidents in the vicinity of runway ends. Since the inclusion of Navaids as an eligible item of airport development under the Airport and Airway Development Act of 1970, our criteria has stipulated frangible structures for the approach lighting system. Construction using this criteria has been accomplished under this program since 1973 at numerous locations. We have been installing low impact resistance structures in all new Medium Approach Lighting Systems (MALS) since 1975 in the agency's Facilities and Equipment Program and plan to continue the program in the future. A prototype design has been completed for Approach Lighting System with Flasher (ALSF) installations and is presently being installed at Detroit, Michigan. While we have no assurance that the retrofit program can be completed within the three to five year timeframe recommended, we are implementing the program as rapidly as resources allocated by the Congress and other demands placed on the agency permit.

An amendment to Part 139 is presently being developed in the Office of Chief Counsel that will clarify the requirement that all objects located in any safety area will be on frangible mounted supporting structures. Target date for publishing the NPRM for this amendment is February 1978.

Sincerely,

Quentin S. Taylor

Quentin S. Taylor
Deputy Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON. D.C.

April 20, 1977

Honorable Quentin S. Taylor
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-77-16 and 17

On November 16, 1976, Texas International Airlines Flight 987, a McDonnell Douglas DC-9-14, ran off the end of runway 8R during an aborted takeoff at Stapleton International Airport, Denver, Colorado. The aircraft's structure was damaged when the left landing gear collapsed. Structural damage to the left wing caused fuel to leak and feed the fire that erupted on the left side of the fuselage.

The National Transportation Safety Board's investigation of the crash revealed that most of the damage to the aircraft was caused by (1) two ditches -- one 18 inches deep and the other 3 feet deep -- which traversed an area within 1,000 feet of the end of the runway; and (2) the nonfrangible steel structures supporting the approach light system (ALS). The aircraft sustained the most damage within the first 1,000 feet beyond the departure end of runway 8R. The Safety Board believes that, had this area been free of ditches and had the ALS structures been constructed of frangible materials, the aircraft would have sustained significantly less structural damage. Furthermore, the likelihood of fire would have been greatly reduced.

The FAA has recognized the value of an extended runway safety area at airports served by air carriers for several years. However, the criteria are mandatory only at certificated airports which have been constructed recently. We believe that the extended runway safety area increases the level of safety for an aircraft which undershoots or overruns the runway, and we believe that the criteria for the extended runway safety area should be mandatory at all certificated airports, regardless of the date of construction. When the geography of an airport or the availability of airport property will not allow the full 1,000-foot area, the extended runway safety area should be as close to the criteria as possible. At Stapleton International Airport, the land is available for a 1,000-foot safety area, but the safety area has not been established as recommended in AC 150/5335-4.

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Examination of the wreckage revealed that pieces of the ALS structures severed the left outer wingtip. The concrete support structures had been pulled out of the ground. In contrast, the first ALS structure, which had frangible fittings, broke off at the base and caused virtually no damage to the aircraft. During the Eastern Airlines B-727 accident at John F. Kennedy International Airport, June 1975, nonfrangible ALS structures also compounded the severity of the aircraft damage. The Safety Board is aware that the FAA has a retrofit program for the installation of frangible ALS structures. The Safety Board believes this to be a very significant program, which has the potential to provide an important safety advantage at those airports where it has been implemented. Accordingly, the Safety Board believes that the retrofit program should be given a priority to assure that it can be completed in 3 to 5 years.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Amend 14 CFR 139.45 to require, after a reasonable date, that extended runway safety area criteria be applied retroactively to all certificated airports. At those airports which cannot meet the full criteria, the extended runway safety area should be as close to the full 1,000-foot length as possible.
> (Class III, Longer Term Followup) (A-77-16)

> Expedite the retrofit of ALS structures with frangible materials and fittings by allocating additional fundings or by increasing the priority of the existing program so that it can be completed within 3 to 5 years.
> (Class II, Priority Followup) (A-77-17)

TODD, Chairman, BAILEY, Vice Chairman, McADAMS , HOGUE, and HALEY, Members, concurred in the above recommendations.

Kay Bailey

By: Webster B. Todd, Jr.
Chairman

National Transportation Safety Board

Washington, D.C. 20594
August 13, 1981

Office of the Chairman

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Please refer to your letter dated June 16, 1981, further responding to National Transportation Safety Board Safety Recommendations A-79-4 and -5 issued March 8, 1979. These recommendations stemmed from our investigation of the Beechcraft Model 65 accident at Norfolk, Virginia, on March 4, 1978. The airplane's electrical system failed after takeoff. Investigation revealed that the starter relay failed causing the starter motor to run continuously, which eventually resulted in a complete loss of electrical power. Investigation also revealed that this electrical system failure occurred in other makes and models of general aviation aircraft. Safety Recommendations A-79-4 and -5 were formulated to prevent operational hazards associated with such electrical failures. Our comments to your letter follow.

A-79-4. We note that in response to this recommendation the Federal Aviation Administration (FAA) issued Advisory Circular (AC) 91-55 dated October 28, 1980. The AC is to warn general aviation pilots and maintenance personnel of possible total electrical system failure following engine starting. This recommendation is now classified in a "Closed--Acceptable Action" status.

A-79-5. Your earlier response of May 15, 1979, indicated that a study would be conducted to determine if other models of aircraft have similar problems. Your letter of June 16, 1981, does not state whether the study uncovered other aircraft with similar problems, but it does state that current regulations for normal category airplanes (FAR 23) and helicopters (FAR 27) are adequate.

We have conducted our own study and find 159 reports of starter relay failures which have caused extensive engine damage and loss of aircraft. Further, we are concerned with hazards associated with unwanted propeller turning and engine starts in the hangar and on the ramp. Also, we are concerned with inflight electrical failures particularly at night and flights under instrument meteorological conditions. We do not believe that regulations are adequate when one small component can cause failures in the starting system and induce critical electrical failures. Also, we do not believe that the issuance of AC 91-55 is a satisfactory resolution of the problem.

We request the FAA to again review the failures of the starter system on all general aviation aircraft with emphasis on the starter relay and its location in the starter electrical circuit. We will be happy to make our findings available to the FAA staff. Pending your further response, A-79-5 is classified in an "Open--Unacceptable Action" status.

Sincerely yours,

Elwood T. Driver

James B. King
Chairman

for

US Department of Transportation

Federal Aviation Administration

June 16, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendations A-79-4 and A-79-5 issued March 8, 1979, and supplements our letter of May 15, 1979. This also responds to your letter of February 25, 1981, in which you requested an updated status report.

A-79-4. Issue an Advisory Circular or take other appropriate action to alert pilots to the fact that unwanted and unknown continued engine starter operation may result in complete electrical failure in general aviation airplanes in service. Also, describe actions pilots can take to avoid such engine-starter operation.

FAA Comment. As stated in our letter of May 15, 1979, the Federal Aviation Administration (FAA) planned to issue an advisory circular (AC). On October 28, 1980, we issued AC 91-55 entitled, "Reduction of Electrical System Failures Following Aircraft Engine Starting." This AC is designed to warn general aviation aircraft owners, pilots, and maintenance personnel of possible total electrical system failure following aircraft engine starting. A copy of this AC is enclosed. The FAA considers action completed on Safety Recommendation A-79-4.

A-79-5. Amend 14 CFR 23 and 14 CFR 27 to require indication by which a pilot can be advised whenever an electric engine starter is operating.

FAA Comment. FAR 23.1309, as adopted in November 1973 and amended in December 1976, and FAR 27.1309, as recodified in 1964 from CAR 6.606 as adopted in September 1959, provide general safety standards that require all equipment, systems, and installations be designed to prevent hazards to aircraft in the event of malfunction or failure. One means to prevent such hazards from a malfunctioning starter system would be to install an indicator that alerts the pilot to the malfunction. Another means would be to use a starter that could be operated continuously, or to provide a system that is otherwise designed to prevent a hazard should it fail.

Therefore, on the basis of our study referenced in our letter of May 15, 1979, we find that the current regulations for normal category airplanes (FAR 23) and helicopters (FAR 27) are adequate, and we plan no regulatory amendments. Also, we do not anticipate further airworthiness directive action on this matter; AC 91-55 provides equivalent guidance for existing aircraft.

Our regional aircraft certification staffs have been provided copies of your recommendation. Copies of this response will also be provided to the staffs to insure continued application of FAR 23.1309 and 27.1309 accordingly. The FAA considers action complete on Safety Recommendation A-79-5.

Sincerely,

J. Lynn Helms
Administrator

Enclosure

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Subject: REDUCTION OF ELECTRICAL SYSTEM FAILURES FOLLOWING AIRCRAFT ENGINE STARTING

1. PURPOSE. This advisory circular is to warn general aviation aircraft owners/pilots and maintenance personnel of possible total electrical system failure following aircraft engine starting.

2. BACKGROUND. This advisory circular is being issued in response to a safety recommendation made by the National Transportation Safety Board to the Federal Aviation Administration. Aircraft accidents and incidents have occurred shortly after takeoff because the starter relay (solenoid) failed mechanically in the "on" position. This condition causes the starter to run, and if allowed to continue, can result in electrical system overload, overheating of components, and in some cases complete failure of the electrical system and/or destruction of the starter motor and drive assembly. Destruction of the starter drive shaft and gear assembly may also damage the aircraft engine.

3. SAFETY SUGGESTIONS. During maintenance activities, inspect the starter motor, electrical cables, and starter relay areas for evidence of overheating and damage. In addition, a good practice for pilots is to be completely familiar with instrument readings, cockpit sounds, and other indicators following normal engine starting periods. Indications that problems are developing in the starter system could be low voltage, high

Initiated by: AWS-340

ammeter or loadmeter readings, dimming of lights, or excessive noise in radio receivers. A noted change in such known normal conditions could indicate prolonged starter motor running and the engine should be shut down. No futher flight operations should be attempted until the cause is determined and repaired.

M. C. ~~Beard~~ Beard
Director of Airworthiness

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Washington, D.C. 20591

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Office of the Chairman

National Transportation Safety Board

Washington, D.C 20594

FEB 25

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Weithoner:

Please refer to National Transportation Safety Board Safety Recommendations A-79-4 and 5 issued March 8, 1979. The Federal Aviation Administration's response of May 15, 1979, indicated that actions were underway to resolve these recommendations. In our reply of June 8, 1979, we informed the FAA that these recommendations were being held in an "Open--Acceptable Action" status. In order to evaluate their progress and update the public docket, we would appreciate an updated status report.

Sincerely yours,

James B. King
James B. King
Chairman

Office of the
Chairman

National Transportation Safety Board

Washington D.C. 20591

June 8, 1979

Honorable Langhorne Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Thank you for your letter of May 15, 1979, responding to National Transportation Safety Board recommendations A-79-4 and A-79-5. These recommendations emanated from a Safety Board investigation of a Beechcraft, Model 65, accident at Norfolk, Virginia, on March 4, 1978. The airplane's electrical system failed after takeoff. Investigation revealed that the starter relay failed causing the starter motor to continuously energize. The result was complete loss of electrical power. Investigation also revealed that this electrical system failure had occurred in other makes and models of general aviation aircraft. In order to prevent operational hazards associated with the loss of electrical power, the Safety Board recommended that the Federal Aviation Administration (FAA):

> <u>A-79-4</u> Issue an Advisory Circular or take other appropriate action to alert pilots to the fact that unwanted and unknown continued engine starter operation may result in complete electrical failure in general aviation airplanes in service. Also, describe actions pilots can take to avoid such engine-starter operation.

> <u>A-79-5</u> Amend 14 CFR 23 and 14 CFR 27 to require indication by which a pilot can be advised whenever an electric engine starter is operating.

We note that the FAA has issued an Airworthiness Directive with regard to this same problem as it applies to the Beech Model 76. We also note that the FAA has undertaken a study of this problem as it applies to the Beech Model 65 and other aircraft. The FAA's response

indicates that, based on this study, an Advisory Circular will be developed by September 1, 1979, to make pilot and maintenance personnel aware of the problem and provide measures for dealing with it. The response also indicates that necessary regulatory action will be initiated by December 1, 1979.

We appreciate receiving FAA's response and are of the view that actions taken as a result of the FAA study will fulfill the intent of A-79-4 and 5. For the present, these recommendations are being maintained in an "Open--Acceptable Action" status.

Sincerely yours,

James B. King

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

May 15, 1979

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to National Transportation Safety Board Safety Recommendations A-79-4 and 5.

A-79-4. Issue an Advisory Circular or take other appropriate action to alert pilots to the fact that unwanted and unknown continual engine starter operation may result in complete electrical failure in general aviation airplanes in service. Also, describe actions pilots can take to avoid such engine-starter operation.

Comment. We are developing an advisory circular (AC) which will provide pilot and maintenance personnel with awareness of the problem and measures for dealing with it. Because of the several types of aircraft which have experienced this problem, we are conducting a study to assure inclusive applicability of the AC. We expect to complete the study and issue the AC by September 1.

A-79-5. Amend 14 CFR 23 and 14 CFR 27 to require indication by which a pilot can be advised whenever an electric engine starter is operating.

Comment. A recent engine starter relay failure and subsequent loss of all electrical power occurred on a Beech Model 76. An airworthiness directive project has been initiated which will propose a flight manual revision which contains procedures for preflight inspection to detect a malfunctioning engine starter relay and an inflight procedure for restoration of electric power should power loss occur.

In addition, we are studying the problem as it relates to other makes and models. We expect to complete the study by September 30, any action with respect to all relays by December 31, and to initiate any regulatory action considered necessary by December 31. We will advise you of any actions which are undertaken.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: March 8, 1979

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-79-4 and -5

The National Transportation Safety Board is concerned about general aviation engine-starter system failures that sometimes result in complete failure of the airplane's electrical system.

A Beechcraft Queen Air, Model 65, N342N, operating under 14 CFR 135, had a complete electrical failure shortly after takeoff at Norfolk, Virginia, on March 4, 1978. The pilot proceeded to manually extend the landing gear and apparently decided it was down and locked. However, the gear collapsed during the landing roll, and the airplane was substantially damaged. Although the accident can be attributed to failure to follow the checklist for emergency extension of the landing gear, the total electrical failure must be considered the underlying cause. Postaccident examination of the right engine-starter system revealed that the starter case was badly blistered, the starter relay terminal boots were severely damaged by heat, the relay plunger was in the on position, and the relay fixed contact point was fused to the movable contact point. The Safety Board concludes that continued operation of the starter motor had overheated and overloaded the electrical system, causing the complete failure.

A survey of similar experience in the FAA's Service Difficulty Records, covering General Aviation Starter Systems for a 1-year period through August 9, 1978, indicated that there had been at least 26 instances of contactor, often called "relay" or "solenoid," failures. Most, if not all, of these involved uninitiated or continued starter operation. In most cases the fault was noted when the engine rotated with only the master switch activated. However, in six cases, one including another Beechcraft Queen Air, continued starter motor operation apparently was not detected and the electrical system failed completely. At least two of the six cases, both involving Beechcraft B24R's, occurred during IFR flight when loss of the electrical system can be most serious. Other models involved were a Beechcraft A36, a Beechcraft C23, and a Piper PA-31-350.

Among the 20 cases in which the fault apparently was detected and did not result in complete electrical failure, 14 involved Cessnas; most of the 14 were model 210's. The other six involved a Mooney 20F and five Beechcraft models--a Queen Air 65-B80, two B19's, a C24R, and an A36.

Although the records do indicate that some airplanes are more prone than others to develop this kind of fault, the Safety Board believes that the hazard potential is sufficiently universal as to call for industrywide attention.

The Safety Board believes that aircraft owners and pilots should be warned of the possibility of encountering electrical system failure as a result of the unintentional or continued operation of starter motors, and should be provided guidance regarding means of reducing the risk of such failures. Such means could include modification of existing aircraft electrical systems to require contactor redundancy or periodic inspection or replacement of certain electrical components. For future production aircraft, the Safety Board believes that some positive means should be provided to indicate to the pilot that an engine starter is operating.

Accordingly, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Advisory Circular or take other appropriate action to alert pilots to the fact that unwanted and unknown continued engine starter operation may result in complete electrical failure in general aviation airplanes in service. Also, describe actions pilots can take to avoid such engine-starter operation. (Class II--Priority Action) (A-79-4)

> Amend 14 CFR 23 and 14 CFR 27 to require indication by which a pilot can be advised whenever an electric engine starter is operating. (Class III--Longer Term Action) (A-79-5)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, and HOGUE, Members, concurred in the above recommendations.

By: James B. King
Chairman

US Department
of Transportation

**Federal Aviation
Administration**

August 19, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendations A-73-68 and A-74-5 issued September 5, 1973, and February 6, 1974, respectively. These recommendations concern the requirement for protective breathing equipment (PBE).

A-73-68. Require emergency oxygen bottles with full-face smoke masks for each cabin attendant on turbine-powered transport aircraft in order to permit the attendants to combat lavatory and cabin fires.

A-74-5. Require that transport category airplanes certificated under Part 4b of the Civil Air Regulations prior to the effective date of Amendment 4b-8 comply with Part 25.1439 of the Federal Aviation Regulations.

FAA Comment. The Federal Aviation Administration (FAA) established a project in 1977 to investigate the need to update the type certification and operating regulations applicable to PBE. The anticipated changes would have required that PBE comply with an updated technical standard order (TSO) and that PBE meeting the provisions of that TSO, be provided in certain transport category airplanes and helicopters.

Since 1977, a new nonrulemaking process for approval of TSO revisions has been established. Thus, it is no longer necessary to initiate rulemaking to update a TSO. The rulemaking project on PBE has been terminated because it would not materially contribute to maintaining a safe aviation system and would not provide meaningful productivity improvements and cost savings in regulations. TSO-C78 is currently being revised under the new process. When this effort is completed, FAA intends to issue an advisory circular recommending that operators modify their PBE to the new TSO, specify who is responsible for furnishing PBE, and provide additional PBE for flight attendants.

The Board will be informed of significant progress as our efforts continue in this area.

Sincerely,

J. Lynn Helms
Administrator

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This will supplement our September 15 letter concerning the status of NTSB Safety Recommendation A-74-5.

A sentence was inadvertently omitted from the letter noted above. The third paragraph under "Action" should read as follows:

Airworthiness Review Program Amendment No. 3 covering Proposals 2-91 and 2-213 was published on December 20, 1976. The proposed amendment to Section 25.1439(a) was adopted. The proposed amendment to Section 25.1439(b) was withdrawn based on comments which stated that the action was premature in view of current testing by the FAA. The proposal to amend Section 121.337 was also withdrawn since the proposal (Section 25.1439(b)) to which it refers was withdrawn.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF THE ADMINISTRATOR

September 15, 1978

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Mr. Chairman:

This is to advise you concerning the status of NTSB Safety Recommendation A-74-5.

A-74-5. Require that transport category airplanes certificated under Part 4b of the Civil Air Regulations prior to the effective date of Amendment 4b-6 comply with Section 25.1439 of the Federal Aviation Regulations.

Action. Our response dated April 23, 1974, to the recommendation stated our plans to propose amendments to Section 25.1439(a).

Proposal 2-91 to amend Sections 25.1439(a) and (b), and Proposal 2-213 to amend Section 121.337, were included in Notice 75-10 published on March 7, 1975.

Airworthiness Review Program Amendment No. 3 covering Proposals 2-91 and 2-213 was published on December 20, 1976. The proposed amendment to Section 25.1439(b) was withdrawn based on comments which stated that the action was premature in view of the current testing by the FAA. The proposal to amend Section 121.337 was also withdrawn since the proposal (Section 25.1439(b)) to which it refers was withdrawn.

As a result of the testing noted above, a project to develop proposals to amend Sections 25.1439(b) and 121.337 was initiated. A Notice of Proposed Rule Making is scheduled to be issued for this project within the next year.

Sincerely,

Quentin S. Taylor
Quentin S. Taylor
Deputy Administrator

2 Enclosures:
Federal Register dated March 7, 1975
Federal Register dated December 20, 1976

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20590

OFFICE OF
THE ADMINISTRATOR

APR 22 1974

Honorable John H. Reed
Chairman, National Transportation
Safety Board
Department of Transportation
Washington, D. C. 20591

Dear Mr. Chairman:

This is in further response to our February 5 letter concerning Safety Recommendations A-74-5 and 6 resulting from the Board's investigation of the Pan American World Airways, Inc., accident at Boston, Massachusetts, on November 3, 1973.

The one-time inspection recommended has been completed. This included an evaluation of smoke masks provided the flight crews for conformance with FAR 25.1439 as well as the operators' smoke evacuation procedures and crew training. The inspection revealed that a number of the smoke goggles provided for the flight crews did not meet the requirements of FAR 25.1439. Corrective action has been taken.

This inspection also revealed that FAR 25.1439 is not being interpreted as an inclusive rule for all pressurized transport airplanes since it alludes to cargo compartment configuration rather than to the general protection for the crew. Therefore, we plan to propose an amendment to FAR 25.1439(a) to clarify the requirement to provide protection from smoke, carbon dioxide, and other harmful gases for all appropriate crewmembers of pressurized transport airplanes An additional amendment to FAR 121.337 is planned to specify that protective breathing equipment for flight crews required in the operating rules are to meet the requirements of FAR 25.1439 and that procedures be established for crewmembers to use 100% oxygen in a smoke/fire emergency.

We believe that the actions taken and planned are consistent with the Board's Safety Recommendations A-74-5 and 6.

Sincerely,

James E. Dow
for
Alexander P. Butterfield
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
DEPARTMENT OF TRANSPORTATION
WASHINGTON, D.C. 20591

OFFICE OF
THE CHAIRMAN

APR 15 1974

Honorable Alexander P. Butterfield
Administrator
Federal Aviation Administration
Washington, D. C. 20591

Dear Mr. Butterfield:

The attached proposals are submitted in response to the FAA's request that the National Transportation Safety Board participate in your forthcoming Airworthiness Review Program as outlined in Notice No. 74-5.

Most of the Safety Board's proposals are derived from, or are based on, a review of recommendations previously submitted to the FAA which we believe relate to airworthiness.

In each instance we have referred to the recommendation by its NTSB Recommendation number.

Sincerely yours,

(original signed by): Adm. Louis M. Thayer

John H. Reed
Chairman

Attachments

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: February 6, 1974

Forwarded to:
Honorable Alexander P. Butterfield
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-74-5&-6

The National Transportation Safety Board's continuing investigation of the Pan American World Airways, Inc., B-707 freighter accident at Boston, Massachusetts, on November 3, 1973, has disclosed an unsafe condition that should be corrected.

Although the cockpit voice recorder indicates that crewmembers were wearing smoke goggles during the final phases of the flight, the Board's investigation indicates that the captain may have had difficulty seeing because of smoke.

The captain's medical records revealed that he was required to possess corrective glasses while flying. The Board examined smoke goggles from other Pan American B-707 aircraft which were the same type as the goggles used by the crewmembers of the accident aircraft. The examination disclosed that if a crewmember wore corrective glasses, the smoke goggles would not fit properly at the temples and, therefore, would not provide the needed protection against smoke.

Additionally, an examination of smoke goggles used by Pan American and several other air carriers on transport aircraft disclosed that they do not comply with the provisions of FAR Part 25.1439. Specifically, some of these smoke goggles do not adequately protect the flightcrew from smoke when worn either with or without corrective glasses. Other smoke goggles in use restrict the wearer's vision appreciably.

The accident aircraft was certificated under Part 4b of the Civil Air Regulations at a time when smoke goggles were not required to be designed to accommodate a user wearing corrective glasses.

1209B

Subsequent amendments to Part 4b (Amendment 4b-8) and paragraph 25.1439 of the currently effective FAR Part 25 provide that smoke goggles shall allow for corrective glasses to be worn.

FAR Part 25.1439 provides that smoke goggles must be designed to protect the flightcrew from smoke, carbon dioxide, and other harmful gases and allow for the wearing of corrective glasses. The Safety Board believes that this safety requirement should apply to all transport category airplanes, notwithstanding the regulations applicable at the time of aircraft certification.

Accordingly, the National Transportation Safety Board recommends that the Federal Aviation Administration:

1. Require that transport category airplanes certificated under Part 4b of the Civil Air Regulations prior to the effective date of Amendment 4b-8 comply with Part 25.1439 of the Federal Aviation Regulations;

2. Require that a one-time inspection be made of all smoke goggles provided for the flightcrew of all transport category airplanes to assure that these goggles conform to the provisions of Part 25.1439 of the Federal Aviation Regulations.

REED, Chairman, McADAMS, and HALEY, Members, concurred in the above recommendations. THAYER and BURGESS, Members, were absent, not voting.

John H. Reed

By: John H. Reed
Chairman

THESE RECOMMENDATIONS WILL BE RELEASED TO THE PUBLIC ON THE ISSUE DATE SHOWN ABOVE. NO PUBLIC DISSEMINATION OF THE CONTENTS OF THIS DOCUMENT SHOULD BE MADE PRIOR TO THAT DATE.

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

May 3, 1979

Honorable Langhorne Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Thank you for your letter of March 14, 1979, reporting the status of safety recommendations A-73-67, 68, and 70. These are three of four recommendations that were made as a result of the Varig Airlines, Boeing 707 in-flight fire near Paris, France, on July 11, 1973. Our comments are as follows:

A-73-67 -- We are pleased to note that the Federal Aviation Administration (FAA) has taken action to require frequent inspections of lavatories by cabin attendants. The status of this recommendation is now classified as "Closed - Acceptable Action."

A-73-68 -- We note that the revised Section 25.1439(a) of the Federal Aviation Regulations now requires protective breathing equipment for cabin attendants and includes masks for the eyes, nose, and mouth, plus oxygen for 15 minutes. However, we intend to keep this recommendation in an "Open - Acceptable Action" status, pending the completion of the tests presently being conducted on breathing equipment and the adoption of new standards for masks and eye coverings.

A-73-70 -- The Safety Board's concern and recommendations regarding fire prevention and propagation date back many years. We regret that there has been no advance to contain or control flammable fluids or to eliminate the toxic effects of burning cabin materials. We appreciate the establishment of the Special Aviation Fire and Explosion Reductions (SAFER) Advisory Committee, and we trust that the research and development efforts underway will improve survivability in the post-crash fire environment. We request that we be kept apprised of developments in this area. This recommendation is being maintained in an "Open - Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 14, 1979

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to your letter of January 11 which requests the status of our actions with respect to National Transportation Safety Board (NTSB) Safety Recommendations A-73-67, 68 and 70.

A-73-67. Require a means for early detection of lavatory fires on all turbine-powered, transport-category aircraft operated under Part 121 of the Federal Aviation Regulations, such as smoke detectors or operating procedures for the frequent inspection of lavatories by cabin attendants.

Comment. Air Carrier Operations Bulletin No. 1-76-17, "In Flight Lavatory Fires," issued September 18, 1973, instructed Principal Operations Inspectors to encourage their assigned air carriers to place "No Smoking" signs on the cabin side of the lavatory doors, include a statement in the flight attendant briefing announcements that smoking is not permitted in the lavatories and that the flight attendants' procedures should include visual inspections of lavatories prior to takeoff and periodically in flight.

In addition, Principal Operations Inspectors were instructed to review their assigned carriers' training programs to assure that crewmembers receive practical training in firefighting techniques.

Airworthiness Directive Amendments 39-1818, "Transport Category Aircraft," effective April 30, 1974; 39-1986, "Boeing," effective November 15, 1974; 39-2069, "General Dynamics," effective January 24, 1975; and 39-2070, "McDonnell Douglas," effective January 9, 1975, were issued. These directives related to all transport category aircraft and to specific models of Boeing, General Dynamics and McDonnell Douglas airplanes. They direct certain general inspections, applicable to all transport category aircraft, of lavatory linen or paper receptacles, installation of "No Smoking" signs, installation of lavatory "No Cigarette Disposal" signs, installation of removable ashtrays near the lavatory doors and specific inspections and lavatory modifications to certain models of Boeing, General Dynamics and McDonnell Douglas airplanes.

Proposals 8-42 and 8-118, "Airworthiness Review Program Notice No. 8," propose to revise Federal Aviation Regulations Sections 25.853 and 121.312 to require lavatory waste receptacles to be fully enclosed, constructed of fireproof materials and to contain fires likely to occur in the receptacle under normal use. In addition, "No Smoking in Lavatory" placards and ashtrays would be required. These proposals are in process and final action is expected in June 1979.

A-73-68. Require emergency oxygen bottles with full-face smoke masks for each cabin attendant on turbine-powered transport aircraft in order to permit the attendants to combat lavatory and cabin fires.

Comment. A revision to Federal Aviation Regulations Section 25.1439(a) was adopted under Amendment 25-38 issued December 13, 1976, and effective February 1, 1977. This requires the installation of protective breathing equipment in each isolated separate compartment in the airplane in which crewmember occupancy is permitted during flight for the maximum number of crewmembers expected to be in the area during any operation.

Airworthiness Review Program, Notice of Proposed Rule Making 75-10, Proposal 2-91, which proposed to amend Section 25.1439(b)(2)(ii) concerning standards for masks and eye coverings, was withdrawn. This proposal was considered premature in view of the testing being conducted on this type equipment. New standards are being considered for a later rulemaking project.

A-73-70. Organize a Government/industry task force on aircraft fire prevention to review design criteria and formulate specific modifications for improvements with respect to the fire potential of such enclosed areas as lavatories in turbine-powered aircraft operating under the provisions of Part 121 of the Federal Aviation Regulations.

Comment. A government/industry committee was established under the National Academy of Sciences. Their efforts resulted in Reports Numbers NMAB 318-6, " Aircraft, Civil and Military, Volume 6," dated 1977 and NMAB 318-3, "Smoke and Toxicity, Volume 3," dated 1978. These reports contain valuable information, however, they do not cover the entire spectrum of the problems relating to improving fire and noxious gas protection in aircraft cabins.

Comments on several notices of proposed rule making relating to cabin interior materials and testimony given in a public hearing and inquiry, "Compartment Interior Materials in Transport Category Airplanes," November 14-18, 1977, indicated that further study and technical development were necessary.

Notice of the establishment of the Special Aviation Fire and Explosion Reduction (SAFER) Advisory Committee was issued May 26, 1978. This Committee, composed of government and industry representatives, will guide and monitor the research and development efforts and recommend ways to improve survivability in the postcrash environment. The first meeting is tentatively scheduled for April or May of this year. Present plans are for three to four meetings per year. The Committee will terminate in June 1980, unless it is extended. Members of the NTSB staff have responded to invitations for membership. Their participation is welcomed.

The goal of the Committee is to develop a report to the Administrator by June 1980 concerning courses of action which should be taken to minimize postcrash injuries by implementing actions to direct or redirect new or in-being research and to undertake rulemaking as appropriate.

We will keep you advised of the progress of this effort. Copies of cited notices, bulletins and airworthiness directives are enclosed.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

10 Enclosures

Office of the
Chairman

National Transportation Safety Board

Washington D.C. 20594

11 JAN 1979

Honorable Langhorne Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to Safety Board recommendations A-73-67 through 70 issued September 5, 1973. These recommendations called for measures for the prevention and early detection of lavatory fires on turbine-powered transport aircraft. On receipt of the Federal Aviation Administration's response dated May 2, 1974 and the issuance of Airworthiness Directives (1) 74-08-09 TRANSPORT CATEGORY AIRCRAFT: Amendment 39-1818, (2) 74-21-03 BOEING: Amendment 39-2376, (3) 75-02-05 McDONNELL DOUGLAS: Amendment 39-2070, safety recommendation A-73-69 was evaluated and its status classified as "Closed - Acceptable Action." However, our records indicate that safety recommendations A-73-67, 68, and 70 are in an "Open - Acceptable Action" status pending FAA's rulemaking action. We would appreciate being informed on the progress of these recommendations.

Sincerely,

James B. King

James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
DEPARTMENT OF TRANSPORTATION
WASHINGTON, D.C. 20591

OFFICE OF
THE CHAIRMAN

March 28, 1974

Honorable Alexander P. Butterfield
Administrator
Federal Aviation Administration
Department of Transportation
Washington, D. C. 20591

Dear Mr. Butterfield:

On September 5, 1973, the National Transportation Safety Board issued Safety Recommendations A-73-67 through 70, which dealt with the detection, control, and prevention of in-flight fires in aircraft lavatories, and reevaluation of compliance with Civil Air Regulations on Boeing 707 aircraft. It was also recommended that a Government/industry task force be organized to review aircraft design criteria as it relates to fire prevention.

The FAA acknowledged these recommendations on September 7, 1973. To this date, however, the Safety Board has not received a substantive response to these recommendations. The Safety Board is still concerned about detection, control, and prevention of in-flight fires in aircraft lavatories. Please advise us at your earliest opportunity what action, if any, the FAA has taken in these matters.

Sincerely yours,

John H. Reed

John H. Reed
Chairman

UNITED STATES OF AMERICA
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 5, 1973

Adopted by the NATIONAL TRANSPORTATION SAFETY BOARD
at its office in Washington, D. C.
on the 22nd day of August 1973

FORWARDED TO:
Honorable Alexander P. Butterfield
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATIONS A-73-67 thru 70

A recent in-flight fire on a Boeing 707-300 (series) aircraft resulted in 124 fatalities and total destruction of the aircraft after a successful emergency landing. The in-flight cabin interior fire did not involve the aircraft's fuel but was fed by the interior's material.

Although the accident remains under investigation at the present time, and the cause of the fire has not been determined by the state conducting the investigation, the National Transportation Safety Board has been advised through its accredited representative who has participated in the investigation that the smoke origin was in the area of the aft lavatories.

The Board is also aware of and is seriously concerned over the number of in-flight fires that have occurred during the past several years as a result of ignition of flammable materials in lavatories of large jet transport aircraft.

A limited examination of such aircraft lavatories by our staff has disclosed the following: (1) no fireproof waste material containers are provided in the lavatories; (2) frequently, cigarette butts are found in waste paper containers during cleaning operations at the termination of flights; (3) waste paper fragments and other flammable materials, such as lint and dust particles, can enter inadvertently into terminals or electrical units; (4) full-face smoke masks with emergency oxygen bottles are

not provided for the cabin crew; and (5) lavatories are vented in such a manner as to exhaust any odors or smoke in the case of lavatory fires, thus precluding detection in the cabin area until a serious fire is in progress.

The National Transportation Safety Board, therefore, recommends that the Federal Aviation Administration:

1. Require a means for early detection of lavatory fires on all turbine-powered, transport-category aircraft operated under Part 121 of the Federal Aviation Regulations, such as smoke detectors or operating procedures for the frequent inspection of lavatories by cabin attendants.

2. Require emergency oxygen bottles with full-face smoke masks for each cabin attendant on turbine-powered transport aircraft in order to permit the attendants to combat lavatory and cabin fires.

3. Reevaluate certification compliance with section 4b.381(d) of the Civil Air Regulations on Boeing 707 series aircraft.

4. Organize a Government/industry task force on aircraft fire prevention to review design criteria and formulate specific modifications for improvements with respect to the fire potential of such enclosed areas as lavatories in turbine-powered aircraft operating under the provisions of Part 121 of the Federal Aviation Regulations.

The Bureau of Aviation Safety staff has briefed technical staff members from your Flight Standards Service, AFS-50 and AFS-300, as well as members of the Aircraft and Airport Operating Problems Branch of the National Aeronautics Space Administration.

If we can be of further assistance in this matter, please feel free to contact us.

McADAMS, THAYER, and HALEY, Members, concurred in the above recommendations. REED, Chairman, and BURGESS, Member, were absent, not voting.

William R. Haley, Acting

RECEIVED

By: John H. Reed
Chairman

THESE RECOMMENDATIONS WILL BE RELEASED TO THE PUBLIC ON THE ISSUE DATE SHOWN ABOVE. NO PUBLIC DISSEMINATION OF THE CONTENTS OF THIS DOCUMENT SHOULD BE MADE PRIOR TO THAT DATE.

(1167)

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

August 26, 1981

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Thank you for your letter dated June 10, 1981, further responding to National Transportation Safety Board Safety Recommendations A-74-105 and A-74-107 through A-74-112. These recommendations stemmed from our Special Study--"Safety Aspects of Emergency Evacuations from Air Carrier Aircraft." Companion Recommendations A-74-106, A-74-113, and A-74-114 are in a "Closed--Acceptable Action" status. Our comments to your response follow:

A-74-105. Based upon the Federal Aviation Administration's (FAA) Notice of Proposed Rulemaking, this recommendation is maintained in an "Open--Acceptable Action" status.

A-74-107. We note that the FAA has amended 14 CFR 25.809 as recommended. Regarding the second part of the recommendation which applies to the earlier wide-body jets, calling for new slides to be installed after a reasonable date, we agree that such retrofitting may prove financially burdensome to some carriers. Since these airplanes have many alternate emergency exits, we do not wish to pursue this part. We are satisfied with the FAA's response and classify A-74-107 in a "Closed--Acceptable Action" status.

A-74-108. We believe that the need for automatic inflation slides overrides the financial burden that may be imposed. These systems have been in use for over 10 years and have proven their worth. We are of the view that the cost of upgrading these slides, over a period of time and during the normal maintenance cycle of the airplane, to be reasonable and justified. Since the FAA has determined not to take any action on this old recommendation, we are classifying it in a "Closed--Unacceptable Action" status.

A-74-109. The Board considers external lights vital for safe evacuation at night. The absence of light delays the evacuation process because passengers are reluctant to jump onto a slide or leave the airplane when they cannot see the ground. While we agree that a retrofit requirement might impose a financial burden to some carriers, we do not agree that adequate lighting cannot be built into newly certificated aircraft without a large increase in cost. We request a reconsideration of this recommendation which we are maintaining in an "Open--Unacceptable Action" status.

A-74-110. In light of the FAA's response, we have reconsidered our recommendation and agree that all flight attendants should be proficient in emergency evacuation and the use of megaphones, and that it would be impractical for air carriers to designate special flight attendants for such duties. This recommendation is classified in a "Closed--Reconsidered" status.

A-74-111. We are satisfied with the response and appreciate your offer to keep us informed of the progress of the FAA's Operations Review Program. This recommendation is classified in an "Open--Acceptable Action" status.

A-74-112. We recommended that the FAA require that air carrier passengers be alerted, during pretakeoff briefings, of the need to familiarize themselves with the procedures involved in the operation of emergency exists. Advisory Circular 121-24 dated June 23, 1977, is responsive to this recommendation. Accordingly, Safety Recommendation A-74-112 is classified in a "Closed--Acceptable Alternate Action" status.

Sincerely yours,

James B. King
Chairman

U.S. Department
of Transportation

**Federal Aviation
Administration**

June 10, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendations A-74-105, and A-74-107 through A-74-112 issued January 5, 1975. This also responds to your letter of March 18, 1981, in which you requested a report of the Federal Aviation Administration's (FAA) actions on these recommendations. We note that A-74-106, -113, and -114 were closed previously by official Board action.

A-74-105. Require that air carriers report all emergency evacuation slide deployments, failures, and malfunctions to the FAA.

FAA Comment. A Notice of Proposed Rulemaking (NPRM) (Operations Review Program: Notice No. 11) has been issued and published in the Federal Register, Vol. 46, No. 12, Monday, January 19, 1981. This NPRM proposes to add a paragraph to 121.703(a) to require each certificate holder to ". . . Report the occurrence or detection of each failure, malfunction, or defect concerning -- (18) Emergency Escape Slides . . . ." A copy of this document is enclosed. We will notify the Boar after making our final rulemaking decision.

A-74-107. Amend 14 CFR 25.809 to require that the length of the emergency evacuation slides be such that the angle with ground renders the slide safe and usable after collapse of one leg, or more, of the landing gear, and amend 14 CFR 121.310 to require that these new slides be installed after a reasonable date.

FAA Comment. A final rule (Operations Review Program: Amendment No. 10; Airworthiness, Equipment, and Operating Rules) has been issued amending § 25.809(f)(1)(iii) as published in the Federal Register (44 FR 11323, October 25, 1979). A copy of the final rule is enclosed. The second portion of this recommendation ". . . amend 14 CFR 121.310 . . ." was originally included in the Operations Review Program mentioned above but was removed from further consideration by the FAA by Operations Review Program Notice No. 10 (43 FR 37958, August 24, 1978). As explained in Notice 10, our analysis established that requiring the retrofit of existing

airplanes that do not comply with the revised § 25.809(f)(1)(iii) requirements is unwarranted because the burdens associated with making these changes are not commensurate with the anticipated increase in safety. Accordingly, the FAA considers action on Safety Recommendation A-74-107 completed.

A-74-108. Amend 14 CFR 121.310 to require, after a reasonable date, that emergency evacuation slides on all floor-level exits be automatically inflated upon deployment.

FAA Comment. This recommendation is also addressed in Operations Review Program: Notice No. 11, Federal Register, January 19, 1981. We believe that current regulations provide an acceptable level of safety and the recommended change does not justify the significant economic burden that would result. The public was advised of the withdrawal of this proposal in the Federal Register, Vol. 46, No. 12, dated January 19, 1981. Accordingly, this proposal was removed from consideration and the FAA intends to take no further action on Safety Recommendation A-74-108.

A-74-109. Amend 14 CFR 25.812 to require that exterior emergency lighting be activated automatically when exits are opened in the emergency mode, and amend 14 CFR 121.310 to require such automatic activation after some reasonable date.

FAA Comment. This recommendation is also addressed in the Final Rule, Operations Review Program: Amendment No. 10, Federal Register, October 25, 1979. The FAA had determined that safety would not be improved as a result of the recommended change to 25.812 and that the recommended change to § 121.310(h)(1)(iii) would impose financial burdens on the public not commensurate with the increase in safety. As a consequence, the proposed changes to §§ 25.812 and 121.310(h)(1)(iii) were withdrawn and the public was advised of this withdrawal in the Federal Register, (44 FR 61323 dated October 25, 1979). Accordingly, the FAA intends to take no further action on Safety Recommendation A-74-109.

A-74-110. Require that the air carriers designate the flight attendant(s) who will be responsible for use of the megaphone(s) during an evacuation, and relocate the megaphone(s) so they are within easy reach of that flight attendant(s)' seat. Consideration should be given to the installation of new, light and compact megaphones to facilitate stowage and use.

FAA Comment. Megaphones are already required by § 121.309(f)(2) to be readily accessible from normally located flight attendant seating. A proposal that would have revised § 131.309(f), to require that the certificate holder designate the flight attendant responsible for the use of the megaphone during an emergency evacuation has been withdrawn from Operations Review Program Notice No. 11. This proposal will not receive further consideration because it is impractical for the certificate holder to designate the flight attendant responsible for using the portable megaphones when the need exists. All flight attendants are trained in the use of megaphones and are expected to be proficient in their operation in case

of an emergency. The public was advised of the withdrawal of this proposal in the Federal Register, Vol. 46, No. 12, dated January 19, 1981. Accordingly, the FAA intends to take no further action on Safety Recommendation A-74-110.

A-74-111. Amend 14 CFR 121.318 to require after a reasonable date, that public address systems can be capable of operating on a power source independent of the main aircraft power supply.

FAA Comment. Safety Recommendation A-74-111 is addressed in Operations Review Program: Notice No. 11, Federal Register, January 19, 1981.

A-74-112. Require that air carrier passengers be alerted, during pre-takeoff briefings, of the need to familiarize themselves with the procedures involved in the operation of emergency exits.

FAA Comment. A proposal to amend § 121.571 in accordance with this recommendation has been withdrawn from Operations Review Program Notice No. 11. This proposal will receive no further consideration because the current passenger briefings and information on the printed briefing cards already convey information regarding the operation of emergency exits. Dissemination of this information is being emphasized during crewmember training programs and during passenger briefing that is required by § 121.571. Additionally, this information is clearly posted at each emergency exit. The public was advised of the withdrawal of this proposal in the Federal Register, Vol. 46, No. 12, dated January 19, 1981.

The FAA believes the various actions outlined in this letter are responsive to Safety Recommendations A-74-105 and A-74-107 through -112. Accordingly, we consider action completed in those cases where rulemaking is finalized or the proposal has been withdrawn or action otherwise terminated. For those actions still in a proposed state of rulemaking, we will keep the Board informed of the progress as our Operations Review Program continues.

Sincerely,

J. Lynn Helms
Administrator

Enclosures

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

March 1[illegible], 19[illegible]1

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Weithoner:

As a result of a special study on the "Safety Aspects of Emergency Evacuations from Air Carrier Aircraft," on January 5, 1975, the National Transportation Safety Board forwarded Safety Recommendations A-74-105 through A-74-114 to the Federal Aviation Administration (FAA). Of these ten recommendations, A-74-105, 107, 108, 109, 110, 111, and 112 remain in an open status awaiting further resolution. The FAA's letters of March 26, 1980, and August 6, 1980, indicated that the FAA would review the status of these recommendations and advise the Safety Board shortly.

We are aware that the FAA has taken several actions to resolve these recommendations. In order to evaluate their progress and update the public docket, we again request a written report of further actions taken.

Sincerely yours,

James B. King

James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of Chairman

JUL 30 198

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

By letter dated March 18, 1980, we requested an updated status report on National Transportation Safety Board Safety Recommendations A-74-105, 107, 108, 109, 110, 111, and 112. The Federal Aviation Administration (FAA) acknowledgement letter of March 26, 1980, indicated that the FAA would review the status of these recommendations and advise the Safety Board shortly.

We are anxious to resolve these old recommendations, and we would appreciate being informed as to when we might expect the FAA's review.

Sincerely yours,

James B. King
Chairman

National Transportation
Safety Board

Washington, D.C. 20594

Office of the
Chairman

March 18, 1980

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to the National Transportation Safety Board's Special Study, "Safety Aspects of Emergency Evacuations from Air Carrier Aircraft." As a result of this study, the Safety Board forwarded Safety Recommendations A-74-105 through A-74-114 on January 5, 1975, to the Federal Aviation Administration (FAA). Of these ten recommendations, A-74-106, A-74-113 and A-74-114 are in a "CLOSED--ACCEPTABLE ACTION" status. However, the remaining seven are maintained in an open status awaiting further responsive action by the FAA.

We are aware that the FAA has taken several actions to resolve these recommendations. In order to evaluate their progress and update the public docket, we would appreciate a written report of further responsive actions taken.

Sincerely yours,

James B. King

James B. King
Chairman

RECEIV

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

August 18, 1977

Honorable Webster B. Todd, Jr.
Chairman, National Transportation Safety Board
800 Independence Avenue, SW
Washington, DC 20594

Dear Mr. Chairman:

This supplements our May 9, 1975, letter and responds to your letter dated July 28, requesting a written status report on recommendations A-74-105 thru 114.

A-74-105. Project No. AFS-230-123 was established in June 1976 to review and revise, as necessary, the reporting requirements of FAR's 121.703/705 and 127.313. We are currently evaluating numerous comments from the regions and data from our Maintenance Analysis Center to assist in justifying a rule change. The estimated completion date for this work is December 1977.

A-74-106. A training course on emergency evacuation slide systems commenced on May 5, 1975, at PICO, San Francisco, California.

A-74-108. This recommendation was considered in the First Biennial Operations Review. The proposal will be included in Operations Review Notice #10 which will be published by December 1.

A-74-110. The subject of this recommendation was proposed in the Biennial Operations Review as Proposal #427. The Committee removed the proposal from consideration. Present airline practices make it unnecessary to designate the flight attendant responsible for using the megaphone. Further, it is not considered necessary to tell carriers they must use new, light and compact megaphones. We plan no further action at this time.

A-74-112. This recommendation was transferred to the Biennial Operations Review as Proposal #586. The Committee recommended a Notice of Proposed Rule Making (NPRM). NPRM 77-12 was published in the Federal Register on July 21.

A-74-113. Advisory Circular, AC-121-24, Passenger Safety Information Briefing and Briefing Cards, was signed and forwarded to the printer for publication and distribution on June 23.

A-74-107, 109, 111 and 114. These recommendations were transferred to the Biennial Operations Review as Proposals # 3/429, 4/434, 452 and 513/514, respectively. The proposals are being evaluated for consideration for rulemaking action. Due to the intricacies of the rulemaking process, we are unable to give a reasonable estimate of a date for completion of the evaluations. However, the results of the evaluations will be published in the Federal Register.

Sincerely,

Charles O. Cary

Charles O. Cary
Acting Administrator

National Transportation Safety Board
Washington, D.C. 20594

July 28, 1977

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Dear Mr. Bond:

On January 5, 1975, as a result of an NTSB Special Study of "Safety Aspects of Emergency Evacuations from Air Carrier Aircraft," we submitted ten recommendations to the FAA, A-74-105 through 114. These recommendations have been kept in an open status pending confirmation of FAA's final action.

The FAA's last letter to the Safety Board in response to these recommendations is dated May 9, 1975. We are aware that the FAA has since taken several actions to resolve these recommendations. However, to better evaluate the progress of these recommendations and to bring the public docket up to date, we would appreciate a written status report.

Sincerely,

Webster B. Todd, Jr.
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20590

OFFICE OF THE ADMINISTRATOR

MAY 9 1975

Honorable John H. Reed
Chairman, National Transportation Safety Board
800 Independence Ave., S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This supplements our January 29 response to Safety Recommendations A-74-105 thru 114.

1. A rulemaking project (No. FS-74-47-R) is underway which will revise FAR 121.703 "Mechanical Reliability Reports." Reports of malfunctions or failures of all emergency and survival equipment will be required.

2. FAR 121.309(b) states, "Each item of emergency and flotation equipment listed in this section and in paragraphs 121.310, 121.339, 121.340" and .309(b)(1) continues: "Must be inspected regularly in accordance with inspection periods established in the operations specifications to ensure its condition for continued serviceability and immediate readiness to perform its intended emergency purposes."

FAR 121.310 requires the installation of emergency evacuation equipment. In addition to the operators' responsibilities for the maintenance of the equipment, our inspectors are charged with similar responsibilities as they relate to each operator's total maintenance and inspection program. We cannot exert all of our efforts toward the surveillance of any one particular area or system. Our surveillance is normally overall with special emphasis directed to specific areas as needs arise.

For your information, we have contracted for special training for our maintenance inspectors on the maintenance requirements, operation and inspection of emergency evacuation equipment.

3. While the requirements contained in FAR 37.175 currently provide that evacuation slides be safe and useable with the collapse of any one or two landing gear legs, we believe that these should be reflected in FAR 25.809 and 121.310. Accordingly, we will initiate rulemaking action to amend FAR 25 and 121 which will cover the usability of evacuation slides during adverse gear collapse conditions.

4. FAR Part 25 presently requires each floor level exit more than six feet above ground to be equipped with a slide which automatically deploys and inflates when the exit is opened. FAR 121 requires automatic slides for exits in airplanes currently in service with the exception of passenger entry and service doors. Automatic deployment at opening is required for these doors, but inflation can be accomplished by pulling an inflation lanyard. The fully automatic slide has not been developed to the extent that the time saving for evacuation would justify retrofitting.

5. We agree with this recommendation and will initiate a rulemaking action under FAR Part 25 to require that exterior emergency lighting be activated when the assist means are erected. We will initiate rulemaking action to amend FAR 121.310, as appropriate, when FAR Part 25 has been amended.

6. We agree that air carriers should designate the flight attendants who will be responsible for use of the megaphone(s) during evacuations and relocate the megaphones. We are considering the means by which this can be implemented.

The present rule is within the scope and intent and provides the authority. We will implement the requirement in the near future and advise.

7. We will establish a project to amend FAR 121.318, as appropriate, when the proposed revisions to FAR Part 25 have been adopted.

8. We concur and will issue an air carrier operations bulletin.

9. An advisory circular is being prepared which will publicize the FARs pertaining to cabin and passenger safety in air carrier operations.

10. A regulatory project on cabin attendant training has been initiated. It will include the items in the recommendation.

Sincerely,

James E. Dow

/James E. Dow
Acting Administrator

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

JAN 29 1975

Honorable John H. Reed
Chairman, National Transportation Safety Board
Department of Transportation
Washington, D. C. 20591

Dear Mr. Chairman:

This is to acknowledge receipt of Safety Recommendations A-74-105 through 114.

We are aware of the continuing requirement for emphasis on aircraft cabin safety. During the past year, we have been working closely with the Association of Flight Attendants to determine what kind of equipment and training they believe is needed. We directed all regions to conduct special inspections on cabin safety. A Notice of Proposed Rule Making for the transportation of handicapped persons has been issued. Numerous air carrier operations bulletins pertaining to cabin safety have been issued and a regulatory project to increase training requirements for flight attendants is being developed.

We will continue to stress cabin safety and welcome constructive recommendations for solutions to problems associated with emergency evacuation.

We will respond to the recommendations, in detail, as soon as our review and study of them have been completed.

Sincerely,

Alexander P. Butterfield

Alexander P. Butterfield
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

FOR RELEASE: 6:30 P.M., JAN. 5, 1975 ISSUED: January 5, 1975

Forwarded to:

Honorable Alexander P. Butterfield
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-74-109 thru 114

The National Transportation Safety Board is concerned about the number of passengers who are injured or killed during emergency evacuations from air carrier aircraft. As a result, the Safety Board has conducted a study, "Safety Aspects of Evacuations from Air Carrier Aircraft," which identifies and assesses factors that most often affect emergency evacuations. The study revealed several areas in which actions are needed to make emergency evacuations safer for passengers.

During the study, the Safety Board reexamined air carrier accidents during which emergency evacuations took place and examined the Federal Aviation Administration's incident files. From these sources, 10 recent air carrier accidents were selected and discussed in the study, because they best exemplified the most common circumstances encountered during evacuations following "survivable" aircraft accidents.

The Board's study revealed several deficiencies which have occurred repeatedly and have had a detrimental effect on the success of emergency evacuations:

<u>Evacuation Slides</u>--. Three problem areas were found with evacuation slides. First, because deployments of evacuation slides and their failures to function properly are not reported, the reliability of evacuation slide systems cannot be evaluated. Numerous slide failures were identified in the study; however, because the total number of failures cannot be determined, the total significance of the failures identified cannot be established. Second, manually inflated evacuation slides required more time to make an exit usable than fully automatic slide

systems. In some of the accidents examined, passengers were ready to deplane, or were deplaning, before slides were inflated. Third, it was found that nose-high or tail-high attitudes of wide-bodied aircraft may render some exits unusable, because of the nearly vertical position of the slides. In two accidents studied, slides were unsafe and unusable because of the attitude of the aircraft.

Exterior Emergency Lighting--. Evacuations during darkness require adequate external illumination to reduce the number of injuries. Current exterior lighting systems are activated when main aircraft power is interrupted. During two nighttime accidents studied, the exterior lighting systems were not activated because the aircraft engines were operating during the evacuations; passengers were injured as a result.

Emergency Communications--. Currently, the only type of emergency evacuation communications equipment required by regulation is the megaphone. Megaphones were not used to initiate or to conduct evacuations in any of the accidents or incidents studied. The storage location of megaphones does not place them in easy reach for flight attendants at their evacuation duty stations.

Although the regulations do not require public address systems for emergency communications, these systems are often used to initiate emergency evacuations. However, since the public address systems are not always connected to the emergency electrical supply, they are not always usable when aircraft power is interrupted. The study revealed that a concise evacuation order is essential, and reliable communication during the evacuation is important.

Passenger Safety Information--. While analyzing the 10 specific accidents and other accident information, shortcomings in regulations and procedures for conveying safety information to passengers of air carrier aircraft were revealed. For example, following an evacuation, passengers frequently suggest the need for more safety information, yet they could not recall having heard the pretakeoff briefing, nor had they read the safety information card. These reports are substantiated by Safety Board investigators' observations that passengers generally are not attentive to pretakeoff briefings nor do they read the safety information cards. Since these two sources are generally the only means by which passengers can become acquainted with emergency information, proper presentation of such information is of the utmost importance. Furthermore, the successes of two evacuations which were prebriefed support the conclusion that more adequate safety information must be conveyed to the air carrier passenger and his understanding assured.

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SUMMARY OF FEDERAL AVIATION ADMINISTRATION RESPONSES TO NATIONA--ETC(U)
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Honorable Alexander P. Butterfield (3)

Crewmember Emergency Training--. The performance of the crewmembers during the evacuation has a great potential for causing problems. During several accidents examined, crewmembers either lacked knowledge of the aircraft emergency evacuation systems or failed to follow established procedures. These cases suggest that current crewmember emergency training may be inadequate. The Safety Board has found that the training techniques used by some airlines for crewmember emergency evacuation training rely more on audio-visual demonstrations than on actual "hands-on" training.

In view of the above, the National Transportation Safety Board recommends that the Federal Aviation Administration:

1. Require that air carriers report all emergency evacuation slide deployments, failures, and malfunctions to the FAA.

2. Develop a maintenance surveillance program to insure greater reliability of emergency evacuation slide systems.

3. Amend 14 CFR 25.809 to require that the length of the emergency evacuation slides be such that the angle with the ground renders the slide safe and usable after collapse of one leg, or more, of the landing gear, and amend 14 CFR 121.310 to require that these new slides be installed after a reasonable date.

4. Amend 14 CFR 121.310 to require, after a reasonable date, that emergency evacuation slides on all floor-level exits be automatically inflated upon deployment.

5. Amend 14 CFR 25.812 to require that exterior emergency lighting be activated automatically when exits are opened in the emergency mode, and amend 14 CFR 121.310 to require such automatic activation after some reasonable date.

6. Require that the air carriers designate the flight attendant(s) who will be responsible for use of the megaphone(s) during an evacuation, and relocate the megaphone(s) so they are within easy reach of that flight attendant(s)' seat. Consideration should be given to the installation of new, light and compact megaphones to facilitate stowage and use.

Honorable Alexander P. Butterfield (4)

7. Amend 14 CFR 121.318 to require after a reasonable date, that public address systems be capable of operating on a power source independent of the main aircraft power supply.

8. Require that air carrier passengers be alerted, during pretakeoff briefings, of the need to familiarize themselves with the procedures involved in the operation of emergency exits.

9. Issue an Advisory Circular which would provide standardized guidance to the air transport industry on effective methods and techniques for conveying safety information to passengers.

10. Amend 14 CFR 121.417(c)(4) to eliminate the provision which permits carriers to use demonstrations alone to train crewmembers for certain emergency situations, thus requiring performance of drills in the operation and use of emergency exits.

Representatives of our Bureau of Aviation Safety will be available for consultation in connection with this matter if desired.

REED, Chairman, McADAMS, THAYER, and BURGESS, Members, concurred in the above recommendations. HALEY, Member, did not participate.

John H. Reed

By John H. Reed
Chairman

ESE RECOMMENDATIONS WILL BE RELEASED TO THE PUBLIC ON THE DATE SH . ABOVE. NO PUBLIC DISSEMINATION OF THIS DOCUMENT SHOULD BE MADE PRIOR TO THAT DATE.

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

August 21, 1981

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Reference is made to your letter dated May 1, 1981, further responding to National Transportation Safety Board Safety Recommendations A-76-31, -32, -33, -34, -35, -36, -42, -43, and -44. These are nine of 14 recommendations issued on April 1, 1976, as a result of the Eastern Airlines Boeing 727 accident near the John F. Kennedy International Airport at New York, on June 24, 1975. Companion Recommendations A-76-37, -38, -39, -40, and -41 are in a closed status. The following comments are made to each response.

A-76-31. The Federal Aviation Administration's (FAA) research and development efforts conducted in conjunction with the National Aeronautics and Space Administration (NASA) and the Department of Commerce are laudable. With the information to be derived from the Next Generation Radar (NEXRAD), we trust that airborne equipment will be developed to measure wind components and help pilots avoid wind shear areas. This recommendation is classified in a "Closed--Acceptable Action" status.

A-76-32. We are informed the FAA has developed and installed a Low-Level Wind Shear Alert System (LLWSAS) at 24 airports and that 34 more airports are to be equipped by 1981. We have taken note of the progress of this program and of the FAA's continuing research and development efforts. This recommendation is classified in a "Closed--Acceptable Action" status.

A-76-33. We note that the FAA, along with other government agencies, has undertaken extensive research toward development of sensors for the detection of variations in wind speed components in the approach and takeoff phase of flight. We are informed that developments thus far have proved of limited value but that the FAA will continue to invest in the NEXRAD program. We recognize the technological constraints associated with this recommendation and, in view of the FAA's proposed expansion of the ground-based LLWSAS, we are satisfied that the intent of this recommendation has been met. Safety Recommendation A-76-33 is classified in a "Closed--Acceptable Action" status.

A-76-34. We concur with the FAA regarding the difficulty of translating aircraft acceleration into operational parameters compatible with present wind shear information and believe the efforts made to date are reasonable. We will be pleased to receive the advisory circular when published. This recommendation is classified in an "Open--Acceptable Alternate Action" status.

A-76-35. The FAA's installation of the LLWSAS at 24 airports and plans for a further 34 more systems meet the intent of this recommendation which we classify in a "Closed--Acceptable Action" status.

A-76-36. We requested that thunderstorm information provided to approach controllers and tower controllers be timely. Considering the rapid development, speed, and movement of thunderstorms, it is imperative for such information to be timely. The actions being taken to satisfy this recommendation are commendable, and we appreciate the FAA's offer to keep us informed of significant progress. This recommendation is maintained in an "Open--Acceptable Action" status.

A-76-42. We are satisfied that the FAA/NASA research programs pertaining to the head-up display and autoland operations meet the intent of this recommendation. Safety Recommendation A-76-42 is classified in a "Closed--Acceptable Action" status.

A-76-43. Based upon our acceptance of the actions underway or completed in the case of Safety Recommendations A-76-31 through A-76-36, we believe that the FAA's research efforts satisfy the intent of this recommendation which we classify in a "Closed--Acceptable Action" status.

A-76-44. We are informed of the development and increasing operational use of the LLWSAS. We have noted the FAA's research programs undertaken jointly with the National Severe Storm Laboratory, the Department of Commerce, and NASA. We also note that the FAA is working closely with the National Weather Service to evaluate the feasibility of wind speed and direction recording equipment. In view of actions taken and ongoing, Safety Recommendation A-76-44 is classified in a "Closed--Acceptable Action" status.

Sincerely yours,

James B. King

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

May 1, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendations A-76-31 through 36 and A-76-42 through 44 issued April 1, 1976. This also responds to your requests for updated status reports dated July 21, 1980, and April 17, 1981. We note that Recommendations A-76-37 through 41 were previously closed by official Board action.

These 14 safety recommendations were issued to the Federal Aviation Administration (FAA) as a result of the Eastern Airlines Boeing 727 accident near the John F. Kennedy International Airport at New York on June 24, 1975. At the NTSB/FAA Quarterly Meeting held on March 12, 1980, the FAA was advised that a number of these recommendations were in an "Open" status awaiting further response from the FAA. Action has been completed on Recommendations A-76-37, 38, 39, 40, and 41, and these recommendations have been classified in a "Closed" status. Accordingly, this response addresses Recommendations A-76-31, 32, 33, 34, 35, 36, 42, 43, and 44.

A-76-31. Conduct a research program to define and classify the level of flight hazard of thunderstorms using specific criteria for the severity of a thunderstorm and the magnitude of change of the wind speed components measured as a function of distance along an airplane's departure or approach flight track and establish operational limitations based upon these criteria.

FAA Comment. In manned-flight simulation studies conducted by the FAA, NASA, and industry in 1977-1979, it was found that the longitudinal acceleration capability of an airplane may provide one means to characterize the wind shear penetration capability of an airplane.

Implementation of operational limitations based on such concepts will require, however, more accurate characterization of the variations in windspeed components in and near thunderstorms and development of a means for the pilot to assess this information.

Research programs initiated by the FAA in conjunction with the National Severe Storm Laboratory of the Department of Commerce and NASA to determine the magnitude of windspeed component changes associated with thunderstorms are continuing. Highly instrumented aircraft are being used to penetrate areas of severe weather conditions, the severity of which is measured simultaneously by ground-based radar equipment capable of accurately tracking the aircraft and of measuring the magnitude of the windspeed components. NASA and the FAA are at the same time collaborating in an evaluation of the usefulness of airborne weather radar to identify areas of hazardous wind shear conditions using modifications of existing systems. The FAA, NASA, and the Department of Commerce are also continuing collection and analyses of severe weather windspeed component data collected from instrumented towers to better characterize wind conditions associated with thunderstorms.

With the information derived from these programs and with the use of the Next Generation Radar (NEXRAD) in terminal areas supported by data link capabilities which are also under development, the FAA expects to be able to improve the information on wind shear conditions available to the pilot.

In May 1979, the FAA published an Advanced Notice of Proposed Rulemaking (ANPRM) concerning requirements for airborne wind shear systems. It is possible that an NPRM may eventually be issued, but we cannot forecast an issuance date since this action is incorporated in our current review of regulatory initiatives. This airborne equipment will enable an aircrew to avoid penetration of wind shear areas or, if caught in such conditions, more safely navigate them. It is anticipated that in the longer term, as the ongoing FAA/NASA programs provide the capability to measure wind components, this information may be processed and displayed using avionics to be developed for that purpose.

We believe these ongoing efforts satisfy the intent of Safety Recommendation A-76-31. Accordingly, the FAA considers action completed on this recommendation.

A-76-32. Expedite the program to develop and install equipment which would facilitate the detection and classification, by severity, of thunderstorms within 5 nmi of the departure or threshold ends of active runways at airports having precision instrument approaches.

FAA Comment. The FAA has developed and is implementing a Low-Level Wind Shear Alert System (LLWSAS) designed to detect the horizontal wind shear caused by thunderstorm gust fronts and strong cold fronts in the

vicinity of an airport. The LLWSAS has been implemented and is working well at 24 U.S. airports; installation has been contracted for 34 more airports in 1980 and 1981.

Another ground-based concept to detect thunderstorm outflows which generate gust fronts has also been tested at Atlanta-Hartsfield International Airport. Considered an enhancement to the LLWSAS, it employs pressure sensitive equipment to detect rapid changes in pressure that accompany thunderstorm gust fronts to permit location and tracking of such fronts as they move through approach and departure zones. Preliminary assessments indicate, however, that in its present configuration, the incidence of false alarms may be unacceptably high.

The FAA has also tested a pulse Doppler radar system for use in detection of wind shear in airport approach and departure zones. Initial results indicate that wind direction and speed can be obtained; however, the size of the installation and costs of implementing such a concept using existing technology may be prohibitive.

Because these latter efforts have not led to useful products, emphasis has been placed on further implementation of LLWSAS, development of airborne detection and avoidance equipment, and further radar development. The FAA is a participant with other administrations within the Department of Transportation and with the Departments of Defense and Commerce in a major R&D program to develop the NEXRAD capable of detecting the movement and severity of routine and hazardous weather phenomena, including thunderstorms. The NEXRAD is expected to significantly enhance the detection, classification, and tracking of thunderstorms. The goal for installation of the first operational system is FY-86, and the goal for reaching the full system capability is FY-89. The FAA is pursuing the exploration, development, and implementation of these concepts as rapidly as congressional funding and manning level policies permit. Programs are also underway to develop data link and flight service station (FSS) automation capabilities that will facilitate the transmission of hazardous weather information to the cockpit.

In view of our progress with this program and the continuing R&D efforts, we believe the intent of this recommendation has been satisfied. Accordingly, the FAA considers action completed on Safety Recommendation A-76-32.

A-76-33. Install equipment capable of detecting variations in the speed of the longitudinal, lateral, and vertical components of the winds as they exist along the projected takeoff and approach flightpaths within 1 nmi of the ends of active runways which serve air carrier aircraft.

FAA Comment. The FAA, in conjunction with other government agencies, has invested substantial R&D resources in the development of sensors to detect variations in wind components. These sensors include acoustic

radar, Doppler radar, pulsed laser Doppler, FM/CW (frequency modulation/continuous wave) radar, and acoustic pulsed radar. To date, each of these systems has been found to have technical or economic limitations making implementation impractical.

The NEXRAD program in which the FAA is participating is expected to invest even more substantial resources in the development of radar wind shear detection equipment. The product is not anticipated, however, until late in the 1980's. Even then, because of economic considerations, it may develop that this capability may not be implemented at many of the smaller air carrier serviced airports.

The most promising method of detecting and coping with wind shear conditions developed to date incorporates airborne sensing equipment, a knowledge in the cockpit of winds in the touchdown zone based on data obtained from ground sensing equipment, and an electronic glide slope reference. As a result, the FAA is increasing the number of Instrument Landing Systems (ILS's) at air carrier serviced airports, and implementing the Microwave Landing System that will provide electronic glide slope information in locations where installation of an ILS is impractical. In addition we are proceeding with rulemaking action to require the necessary airborne equipment, developing a data link system to provide timely wind information as well as other hazardous weather information in the cockpit, and, as noted earlier, we are expanding the ground-based LLWSAS. The FAA FSS Automation Program will also enhance the transmittal of hazardous weather information to the cockpit.

In consideration of these efforts, and in recognition of the technological constraints associated with this recommendation, we believe our actions constitute an acceptable alternate solution to satisfy the intent of A-76-33. Accordingly, the FAA considers action completed on this recommendation.

A-76-34. Require inclusion of the wind shear penetration capability of an airplane as an operational limitation in the airplane's operations manual, and require that pilots apply this limitation as a criterion for the initiation of a takeoff from, or an approach to, an airport where equipment is available to measure the severity of a thunderstorm or the magnitude of change in wind velocity.

FAA Comment. As we indicated in our response to Recommendation A-76-31, it is possible to define the acceleration capability or wind shear penetration capability of an airplane. It has been found, however, that translation of these parameters into operational limitations involves too many variables for useful incorporation into an airplane's operational manual. The FAA is, however, proceeding with the preparation of advisory circular material dealing with installation and use of airborne equipment to be used by the aircrew for the purpose addressed in the subject

recommendation. We will forward a copy of this material to the Board when published. With the publication of these documents, the FAA considers action on Safety Recommendation A-76-34 completed.

A-76-35. As an interim action, install equipment capable of measuring and transmitting to tower operators the speed and direction of the surface wind in the immediate vicinity of all runway ends and install lighted windsocks near to the side of the runway, approximately 1,000 feet from the ends, at airports serving air carrier operations.

FAA Comment. The FAA is installing a system that provides for comparison of windspeed and direction, sensed at remote locations on the airport, relative to those values sensed at center field locations. This system called the LLWSAS has been favorably evaluated and is now operational at 24 airports. There are 34 more systems under contract, and delivery will begin on or about October 1, 1981, at the rate of one per week (also see our response to A-76-32).

We have further considered the feasibility of a program effort relative to lighted windsocks. After in-depth study and discussions, it is still our contention that this concept has limited value, and we do not intend to pursue a development effort.

Accordingly, we believe our LLWSAS evaluation and installation effort satisfies the intent of Safety Recommendation A-76-35 and, therefore, the FAA considers action completed on this recommendation.

A-76-36. Develop and institute procedures whereby approach controllers, tower controllers, and pilots are provided timely information regarding the existence of thunderstorm activity near to departure or approach flightpaths.

FAA Comment. There are currently 18 FAA Air Route Traffic Control Centers (ARTCC's) with commissioned Center Weather Service Units (CWSU). Present plans call for installation and testing of auto dial conference call capabilities in the CWSU at the Indianapolis ARTCC. This will allow the CWSU to provide weather information to positions within terminal radar facilities and FSS's that have an En Route Flight Advisory Service (EFAS) function. We plan to use the FSS automation system components to disseminate weather information to FSS's and CWSU's; and our National Airspace Data Interchange Network (NADIN) for communication between CWSU's and FSS's with cathode-ray tube (CRT) displays (1982 budget). An operational test/evaluation of the Color Weather Radar System at Cleveland ARTCC is scheduled for completion by the end of the year. We will keep the Board informed of significant progress in this program effort.

A-76-42. Expedite the research to develop equipment and procedures which would permit a pilot to transition from instrument to visual references without degradation of vertical guidance during the final segment of an instrument approach.

FAA Comment. The FAA is proceeding in several areas with the development of equipment and procedures to permit transition from instrument to visual references during the final segments of the instrument approach. Implementation of autoland is proceeding with the publication of procedures and certification of aircraft facilities and aircrews for Category III operations. The FAA is expanding the implementation of ILS's to provide that service to a wider user group at more locations. The FAA also has underway a program to install additional Visual Approach Slope Indicator (VASI) systems at some precision and many nonprecision approach runways. As of June 30, 1980, the FAA had installed 823 VASI's under the F&E program on runways used by air carriers. Since our last report in 1978, 402 of these have been installed. Evaluations of variations to the VASI system are also underway, including the Precision Approach Path Indicator, that would provide additional information on aircraft position with respect to a selected glide slope relative to the reference glide slope (an advantage to widebody aircraft).

The FAA has amended Parts 91 and 121 of the Federal Aviation Regulations to revise and clarify criteria for the commencement and continuance of instrument approaches and certain requirements applicable to the instrument landing procedures and minimums. These amendments clarify provisions of the current rules, add new provisions necessary to ensure safety in landing in poor visibility, and update regulations to be consistent with current FAA and industry practices and procedures.

In addition, research for longer term solutions has been expedited. The results of a joint FAA/NASA program to determine the benefits to safety during the transition attributable to a head-up display of information are expected early in 1981. Additional study by NASA of the contribution of the head-up display to autoland operations is planned in 1981. Further understanding of the benefits and limitations of a head-up display is expected from flight evaluations to be conducted by the FAA in 1981-1982 using head-up-display-equipped aircraft. Approval of a head-up display for use on a supplemental basis has been completed on the recently certificated DC-9-80 as a result of experience gained by FAA certification specialists in the FAA/NASA program.

We believe these actions fully satisfy the intent of Safety Recommendation A-76-42 and, accordingly, the FAA considers action completed on this recommendation.

A-76-43. Expedite the research to develop an airborne detection device which will alert a pilot to the need for rapid corrective measures as an airplane encounters a wind shear condition.

FAA Comment. As a result of an extensive 4-year study conducted by the FAA, with the support of NASA and industry, the FAA has concluded that practical solutions are available that will make it possible to avoid many of the problems experienced by air carriers involved in wind shear encounters. These various solutions are addressed herein in our comments responding to Safety Recommendations A-76-31 through A-76-36. Accordingly, the FAA considers action on Safety Recommendation A-76-43 completed.

A-76-44. Expedite the development of a program leading to the production of accurate and timely forecasts of wind shear in the terminal area.

FAA Comment. Please refer to our response to Safety Recommendation A-76-35. We believe our progress with the LLWSAS satisfies the intent of this recommendation. Moreover, in our response to A-76-31, we refer to research programs initiated by the FAA in conjunction with the National Severe Storm Laboratory, the Department of Commerce, and NASA to determine the magnitude of windspeed component changes associated with thunderstorms. As stated earlier, these efforts are continuing. Also in this response to A-76-31, we describe additional programs by the FAA and NASA which are designed to evaluate the usefulness of airborne weather radar to identify areas of hazardous wind shear, and collection and analyses of severe weather windspeed component data from instrumented towers. Finally, we are working closely with the National Weather Service in evaluating the feasibility of recording equipment to continuously record wind direction and speed at airports where hourly surface weather observations are made. We will address this effort in more detail in our response to Safety Recommendation A-80-141, which is currently in preparation. In consideration of these continuing efforts, the FAA considers action on Safety Recommendation A-76-44 completed.

Sincerely,

J. Lynn Helms
Administrator

National Transportation Safety Board
Washington, D.C. 20594

Office of the Chairman

April 17, 1981

Honorable J. Lynn Helms
Administrator Designate
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

As a result of the Eastern Airlines Boeing 727 accident near the John F. Kennedy International Airport at New York on June 24, 1975, the Safety Board made 14 recommendations to the Federal Aviation Administration (FAA). At the last two NTSB/FAA Quarterly Meetings, the FAA staff was advised that a number of these recommendations were in an open status awaiting a further response from the FAA.

Also, in reply to a written request for an updated status report, we were advised on July 28, 1980, to expect an answer in the near future. We are anxious to evaluate the progress of these recommendations and would very much appreciate an updated status report.

Sincerely yours,

James B. King

James B. King
Chairman

Office of
Chairman

National Transportation Safety Board

Washington D C 20594

July 21, 1980

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

As a result of the Eastern Airlines Boeing 727 accident near the John F. Kennedy International Airport at New York on June 24, 1975, the Safety Board made 14 recommendations to the Federal Aviation Administration (FAA). At the last NTSB/FAA Quarterly Meeting held on March 12, 1980, the FAA staff were advised that a number of these recommendations were in an open status awaiting a further response from the FAA. In order to evaluate the progress of the recommendations and update the public docket, we would appreciate an updated status report.

Sincerely yours,

James B. King

James B. King
Chairman

JUL 21 4 07 PM

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

JUL 7 1976

Honorable Webster B. Todd, Jr.
Chairman, National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-76-31 through 44.

Recommendation No. 1. Conduct a research program to define and classify the level of flight hazard of thunderstorms using specific criteria for the severity of a thunderstorm and the magnitude of change of the windspeed components measured as a function of distance along an airplane's departure or approach flight track and establish operational limitations based upon these criteria.

Comment. The Federal Aviation Administration (FAA) has already initiated a research program in conjunction with the National Severe Storms Laboratory to determine the magnitude of windspeed component changes in thunderstorms by using a highly instrumented aircraft to penetrate actual thunderstorms. The associated characteristics of the thunderstorms and level of flight hazard are currently being investigated in a second research program which will determine the detrimental effects on aircraft performance and controllability as a function of windspeed component changes. If the results of this research show that meaningful and clearly defined operational limitations can be established based upon these criteria, then we may proceed with appropriate rulemaking. We expect to complete the research by December 1978.

Recommendation No. 2. Expedite the program to develop and install equipment which would facilitate the detection and classification, by severity, of thunderstorms within 5 nmi of the departure or threshold ends of active runways at airports having precision instrument approaches.

Comment. Experimental thunderstorm gust front detection systems will be tested on a high priority basis beginning this summer at Chicago O'Hare and Dulles Airports. These test systems should provide us with the data required to design a production system which could provide

sufficient warning of the approach of any hazardous thunderstorm gust fronts. In addition, we have completed testing and are presently preparing procurement specifications for a radar display device which will portray thunderstorm location and severity derived from an existing remote weather or long range radar. The information is transmitted digitally over telephone lines to the display located in appropriate air traffic control sites.

Recommendation No. 3. Install equipment capable of detecting variations in the speed of the longitudinal, lateral, and vertical components of the winds as they exist along the projected takeoff and approach flightpaths within 1 nmi of the ends of active runways which serve air carrier aircraft.

Comment. The equipment described by the NTSB in this recommendation does not currently exist and, therefore, no installations are possible at this time. However, the FAA, in conjunction with other government agencies, has programs underway to develop and/or refine sensors which are capable of detecting variations in wind components. These sensors include acoustic doppler, doppler radar, pulsed laser doppler, FM/CW radar, and acoustic pulsed radar. Each of these systems has its own technical and economic advantages and limitations; FAA is striving to determine as rapidly as possible which of the many candidates offer the greatest enhancement to safety along the lines of this recommendation with an acceptable cost. We expect to complete this by June 1978.

Recommendation No. 4. Require inclusion of the wind shear penetration capability of an airplane as an operational limitation in the airplane's operations manual, and require that pilots apply this limitation as a criterion for the initiation of a takeoff from, or an approach to, an airport where equipment is available to measure the severity of a thunderstorm or the magnitude of change in wind velocity.

Comment. As stated in our response to the first recommendation, we are currently pursuing the research necessary to establish wind shear related operational limitations for general aircraft types. Regulatory steps must await the successful completion of the research and the installation of appropriate measurement equipment.

Recommendation No. 5. As an interim action, install equipment capable of measuring and transmitting to tower operators the speed and direction of the surface wind in the immediate vicinity of all runway ends and install lighted windsocks near to the side of the runway, approximately 1,000 feet from the ends, at airports serving air carrier operations.

Comment. At present, we are installing anemometers near six runway ends at Chicago O'Hare Airport, and we are planning to make similar installations at Atlanta, Houston, and Denver. However, at present, there is disagreement between aviation meteorological experts as to whether the most appropriate location for anemometers is at the runway threshold, the middle marker, or the outer marker. Other experts feel that microbarographs are superior to anemometers in detecting the most hazardous conditions. FAA is currently conducting research to answer these questions before spending large sums of money on installations which may later prove to be ineffective. (For example, the NTSB's proposed wind measurement location would probably be ineffective in the case of a departing aircraft encountering a thunderstorm gust front shear just past the departure end of the runway.) We expect to complete this research by December 1978.

We believe that lighted windsocks are of limited value and may be a distraction to pilots during low ceiling/visibility operations.

Recommendation No. 6. Develop and institute procedures whereby approach controllers, tower controllers, and pilots are provided timely information regarding the existence of thunderstorm activity near to departure or approach flightpaths.

Comment. Action on this recommendation would be redundant as the FAA has existing programs informing control personnel and users regarding thunderstorm activity. Part of the existing system includes National Weather Service (NWS) data, visual observation, radar data and pilot reports. It should be noted that our on-going "thunderstorm activity" information is just one of the many diversified and necessary types of weather data integral to the system (National Airspace System), and provided through existing procedures and programs. A sampling of other significant weather information includes reports concerning areas of strong frontal activity, squall lines, widespread fog, moderate to heavy icing, turbulence, or similar conditions pertinent to the safety of flight. In our efforts to improve existing procedures, arrangements have been agreed to between the FAA and NWS to test a procedure to alert elements of the air traffic control system and airborne pilots of thunderstorms observed by NWS weather radars 30 miles or closer to any of five major terminals in the Washington, D.C., and New York City areas.

The test has been arranged to determine whether this type of information may be effective operationally to enhance safety.

The test will involve NWS weather radars at Patuxent River, Maryland, Atlantic City, New Jersey, and New York City, New York. FAA facilities participating in the test will include Central Flow Control Facility, Leesburg, Virginia, and Islip, New York, Air Route Traffic Control Centers (ARTCCs), and Air Traffic Control Towers at LaGuardia, New York, J. F. Kennedy, New York, Philadelphia, Pennsylvania, Newark, New Jersey, and Washington National Airport.

NWS weather radar observers, upon detecting a strong weather return, will notify the duty meteorologist at the FAA's Central Flow Control Facility advising him of the location, intensity, and movement of the storm. The Central Flow Control Facility meteorologist will then alert the appropriate air traffic control tower and air route traffic control center. These facilities, in turn, will advise pilots operating in the affected area.

Test procedures will be in effect from June 1 through October 31. An evaluation of the effectiveness of the test will determine whether to extend, expand, or curtail the effort.

Comments from the aviation industry are solicited for use in evaluation.

Recommendation No. 7. Revise appropriate air traffic control procedures to specify that the location and severity of thunderstorms be considered in the criteria for selecting active runways.

Comment. The apparent concern of the NTSB, i.e., adverse winds associated with thunderstorm activities, may be widely separated from the actual observable thunderstorm activity. Accordingly, runway selection on the basis of other than known winds actually affecting the runway in use could very easily result in operational conditions not acceptable by users and, in fact, have an adverse effect/impact on safety in the system. We believe the present air traffic control procedures, which require aircraft to be informed of phenomena likely to produce an adverse safety effect and those requiring avoidance of known areas of possible hazard to safety, provide the best current means of providing pilots the information they need to assess and determine the most appropriate action for their operation. Decisions of this nature must remain with the pilot.

Insofar as severity is concerned, air traffic control has no present effective means of assessing the current severity of thunderstorm activity or the area of airspace that may be affected.

Recommendation No. 8. Modify or expand air traffic controller training programs to include information concerning the effect that winds produced by thunderstorms can have on an airplane's flightpath control.

Comment. The FAA Academy portion of the Air Traffic Training Program which began on January 13 contains a lesson on "Turbulence and Jetstreams." The lesson includes categories of turbulence intensity. Types of turbulence on an airplane's flightpath control is covered in great detail. As we learn more about the causes and effects of wind shear, our training syllabus will be modified accordingly.

Recommendation No. 9. Modify initial and recurrent pilot training programs and tests to require that pilots demonstrate their knowledge of the low-level wind conditions associated with mature thunderstorms and of the potential effects these winds might have on an airplane's performance.

Comment. Air Carrier Operations Bulletin No. 75-8, Subject: Low Level Wind Shear, was issued on December 30, 1975. This bulletin requires our principal operations inspectors to ensure compliance with the recommendations enumerated in this item.

An advisory circular on wind shear phenomena was published on April 8. This circular will be of value to both air carrier and general aviation pilots.

Recommendation No. 10. Expedite the program to develop, in cooperation with appropriate Government agencies and industry, typical models of environmental winds associated with mature thunderstorms which can be used for demonstration purposes in pilot training simulators.

Comment. The FAA, in conjunction with the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA), has already developed models of environmental winds associated with mature thunderstorms and is currently testing them in a piloted simulator. We will make these models available to operators of pilot training simulators. We expect the model to be available by October 1976.

Recommendation No. 11. Place greater emphasis on the hazards of low-level flight through thunderstorms and on the effects of wind shear encounter in the Accident Prevention Program for the benefit of general aviation pilots.

Comment. We concur with this recommendation. We believe that forceful instruction and pilot tests on the knowledge of hazards of low-level wind shear will reinforce the pilot's respect for this particular weather phenomenon. Air taxi pilots are now required to demonstrate this knowledge during initial and recurrent pilot training (Handbook 8430.1A, Operations Bulletin 75-4). Additionally, an FAA Advisory Circular, Low Level Wind Shear, was published April 8.

Accident prevention specialists will continue to emphasize the hazards of marginal weather operations, particularly around thunderstorm activity.

Recommendation No. 12. Expedite the research to develop equipment and procedures which would permit a pilot to transition from instrument to visual references without degradation of vertical guidance during the final segment of an instrument approach.

Comment. The FAA is currently installing over 100 additional VASI systems over the next two years to facilitate the pilot's transition from instrument to visual vertical guidance on approach. In addition, we have just initiated a program to examine the heads-up display as an aid in providing vertical guidance in both wind shear and other meteorological environments. We expect to complete this examination by September 1978.

Recommendation No. 13. Expedite the research to develop an airborne detection device which will alert a pilot to the need for rapid corrective measures as an airplane encounters a wind shear condition.

Comment. The FAA is already well underway with two separate research programs to identify such a device. The programs involved the use of a piloted simulator and a nonpiloted digital aircraft simulator, respectively. Final reports will be available soon from the first phase of both programs, and second phases will be initiated soon to complete development of an airborne wind shear detection device. We expect completion of these programs by December 1976.

Recommendation No. 14. Expedite the development of a program leading to the production of accurate and timely forecasts of wind shear in the terminal area.

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Comment. The National Weather Service has responded positively to an FAA request to provide wind shear forecasts at eight major east coast terminals. A six-month test will begin in August 1976.

Sincerely,

John McLucas

John L. McLucas
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

FOR RELEASE: 6:30 A.M., E.D.T., APRIL 1, 1976
(202) 426-8787

ISSUED: April 1, 1976

Forwarded to:

Honorable John L. McLucas
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-76-31 through 44

On June 24, 1975, Eastern Air Lines Flight 66, a Boeing 727, crashed during a precision instrument approach to the John F. Kennedy International Airport, Jamaica, New York. One hundred and thirteen persons died from the injuries that they received.

The National Transportation Safety Board's investigation of the accident disclosed that the aircraft developed a high descent rate as it passed through or below the base of a mature thunderstorm. The storm was astride the approach course and approximately 1 mile from the end of the runway. The pilots of other flights which preceded Flight 66 on the approach reported that they too had encountered problems in controlling their aircraft to maintain a safe approach profile. These aircraft avoided an accident possibly because the prevailing conditions were less severe or because the pilots recognized and responded to the situation faster than the pilots of Flight 66.

A study of flight recorder data taken from these flights showed that the performance of each of the aircraft was affected by the strong vertical drafts and changes in the direction of the horizontal winds in the vicinity of the thunderstorm. When a simulator, modeled to reproduce the aerodynamic characteristics of the B-727, was exposed to these approach conditions, it became evident that the ability of an airplane to negotiate a safe landing or even a missed approach was marginal. In the case of Flight 66, impact might possibly have been avoided had the flightcrew recognized the onset of the descent rate more quickly.

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However, even though they had been alerted to a wind shear condition, the crew probably did not anticipate the rapid change in the airplane's flight profile. Also, since they had both the approach lights and subsequently the runway in sight, they were probably relying on visual cues for guidance, particularly since the glideslope was designated unusable below 200 feet. There were no visual aids such as VASI to help them detect the deviation below a safe glidepath.

The circumstances of this accident are similar to those of other accidents which have been investigated by the Safety Board. On May 18, 1972, an Eastern Air Lines Douglas DC-9-31 touched down hard on the runway at Fort Lauderdale, Florida; the airplane was destroyed and three persons were injured. On July 23, 1973, an Ozark Air Lines, Inc., Fairchild Hiller FH-227B crashed while on a precision approach to the Lambert-St. Louis International Airport, St. Louis, Missouri. Thirty-seven passengers died in that crash. On January 30, 1974, a Pan American World Airways, Inc., Boeing 707 crashed while on approach to Pago Pago, American Samoa, killing 96 persons. In all of these crashes, the airplanes were penetrating heavy rain and probably the adverse wind conditions associated with a mature thunderstorm.

The potential hazards of flight through or below a fully developed thunderstorm are well recognized. In fact, most, if not all, air carrier operations have established a policy to avoid the intense radar echoes by 20 miles or more when flying at cruising altitudes. This policy is consistent with Advisory Circulars 00-24 and 90-12A. In the terminal environment, however, there appears to be a tendency on the part of pilots, as well as traffic controllers, to let the desire for an uninterrupted flow of traffic interfere with an objective evaluation of the hazard potential of approaches through or under thunderstorms. Consequently, approaches are being conducted through these hazardous conditions during what is perhaps the most critical phase of flight -- when the aircraft is at low altitude, with little airspeed margin, and with the airplane in a high drag configuration.

The Safety Board recognizes the problems in the terminal area which stem from traffic density, air traffic control coordination requirements, complex departure and arrival routes, and adjacent airports. These factors, combined with the characteristics of rapidly developing thunderstorms and the limited weather detection capability of the ATC radar equipment, hinder the coordinated effort which must be made by pilots and controllers to avoid thunderstorms. Nevertheless, the Safety Board believes that these problems can and must be resolved in order to prevent more accidents of this kind.

Since 1973, the Safety Board has submitted to the Administrator, Federal Aviation Administration, eight specific recommendations which can be directly related to accidents involving approaches through conditions similar to those encountered by Flight 66. Copies of these recommendations and the Administrator's responses are attached. The recommendations concerned such areas as the expansion of authority for air traffic controllers to deny approaches or takeoffs through thunderstorms, the development of ATC radar with better severe weather detection capability, the implementation of better systems to relay severe weather warnings to pilots, the installation of VASI on all instrument runways, the issuance of training material and improvements in training programs to stress the effect of wind shear on an airplane's flightpath control, and the development of wind shear detection devices.

The FAA has expressed agreement with many of these recommendations and in some cases action has been taken to comply. In other cases, action has not been taken.

The Safety Board believes that the continuing occurrence of approach accidents involving passage of an airplane through or below thunderstorms indicates that more positive and more immediate actions are necessary. Accordingly, the National Transportation Safety Board recommends that the Federal Aviation Administration, in coordination with the National Oceanic and Atmospheric Administration, where appropriate:

1. Conduct a research program to define and classify the level of flight hazard of thunderstorms using specific criteria for the severity of a thunderstorm and the magnitude of change of the wind speed components measured as a function of distance along an airplane's departure or approach flight track and establish operational limitations based upon these criteria. (Class II - Priority Followup)

2. Expedite the program to develop and install equipment which would facilitate the detection and classification, by severity, of thunderstorms within 5 nmi of the departure or threshold ends of active runways at airports having precision instrument approaches. (Class II - Priority Followup)

3. Install equipment capable of detecting variations in the speed of the longitudinal, lateral, and vertical components of the winds as they exist along the projected takeoff and approach flightpaths within 1 nmi of the ends of active runways which serve air carrier aircraft. (Class II - Priority Followup)

4. Require inclusion of the wind shear penetration capability of an airplane as an operational limitation in the airplane's operations manual, and require that pilots apply this limitation as a criterion for the initiation of a takeoff from, or an approach to, an airport where equipment is available to measure the severity of a thunderstorm or the magnitude of change in wind velocity. (Class II - Priority Followup)

5. As an interim action, install equipment capable of measuring and transmitting to tower operators the speed and direction of the surface wind in the immediate vicinity of all runway ends and install lighted windsocks near to the side of the runway, approximately 1,000 feet from the ends, at airports serving air carrier operations. (Class I - Urgent Followup)

6. Develop and institute procedures whereby approach controllers, tower controllers, and pilots are provided timely information regarding the existence of thunderstorm activity near to departure or approach flightpaths. (Class I - Urgent Followup)

7. Revise appropriate air traffic control procedures to specify that the location and severity of thunderstorms be considered in the criteria for selecting active runways. (Class I - Urgent Followup)

8. Modify or expand air traffic controller training programs to include information concerning the effect that winds produced by thunderstorms can have on an airplane's flightpath control. (Class III - Longer-Term Followup)

9. Modify initial and recurrent pilot training programs and tests to require that pilots demonstrate their knowledge of the low-level wind conditions associated with mature thunderstorms and of the potential effects these winds might have on an airplane's performance. (Class II - Priority Followup)

10. Expedite the program to develop, in cooperation with appropriate Government agencies and industry, typical models of environmental winds associated with mature thunderstorms which can be used for demonstration purposes in pilot training simulators. (Class III - Longer-Term Followup)

11. Place greater emphasis on the hazards of low-level flight through thunderstorms and on the effects of wind shear encounter in the Accident Prevention Program for the benefit of general aviation pilots. (Class II - Priority Followup)

12. Expedite the research to develop equipment and procedures which would permit a pilot to transition from instrument to visual references without degradation of vertical guidance during the final segment of an instrument approach. (Class III - Longer-Term Followup)

13. Expedite the research to develop an airborne detection device which will alert a pilot to the need for rapid corrective measures as an airplane encounters a wind shear condition. (Class III - Longer-Term Followup)

14. Expedite the development of a program leading to the production of accurate and timely forecasts of wind shear in the terminal area. (Class III - Longer-Term Followup)

TODD, Chairman, McADAMS, THAYER, BURGESS, and HALEY, Members, concurred in the above recommendations.

By: Webster B. Todd, Jr.
Chairman

Attachments

THESE RECOMMENDATIONS WILL BE RELEASED TO THE PUBLIC ON THE ISSUE DATE SHOWN ABOVE. NO PUBLIC DISSEMINATION OF THE CONTENTS OF THIS DOCUMENT SHOULD BE MADE PRIOR TO THAT DATE.

US Department
of Transportation

**Federal Aviation
Administration**

September 2, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendation A-71-59 issued November 12, 1971, and supplements our most recent letter of February 7, 1979. This also responds to your letter of April 10, 1981, in which you requested a further progress report regarding actions to be taken by the Federal Aviation Administration (FAA) relative to the recommendations of the Special Aviation Fire and Explosion Reduction (SAFER) Advisory Committee.

A-71-59. The Federal Aviation Administration initiate action to incorporate in its airworthiness requirements, a provision for fuel system fire safety devices which will be effective in the prevention and control of both in-flight and postcrash fuel system fires and explosions. It is further recommended that rulemaking action in this matter specifically apply to future passenger-carrying aircraft in the transport category, and that consideration be given to an adaptation to all other passenger-carrying aircraft now in service.

FAA Comment. The FAA has a study underway which addresses the SAFER Advisory Committee recommendations to require fuel tank vent protection during ground fires, and design practices that maximize the probability of engine fuel supply shutoff in potential fire situations. These SAFER recommendations pertain to the hazard of explosions of undamaged fuel tanks in postcrash fire accidents. If the study indicates the potential benefits to society outweigh the potential costs of implementation of the recommendations, the FAA will consider the recommendation and alternatives for accomplishing the intent of the recommendation.

In accordance with your request of April 10, 1981, the following progress report updates the status of various SAFER recommendations:

ANTIMISTING KEROSENE (AMK). Research and development of antimisting kerosene as a means of reducing hazards associated with post-crash fires is scheduled for completion in 1984. An AMK Conference was conducted at the FAA Technical Center on February 18 and 19, 1981. A copy of the Conference Proceedings, Report No. FAA-CT-81-181, is enclosed.

REDUCED FLASH POINT KEROSENE FUEL. The FAA has a program underway to evaluate the fire safety impact of using kerosene with a reduced flash points.

NTSB/FAA EXPANDED ACCIDENT INVESTIGATION. The revised, NTSB-developed accident reporting form, to provide more information concerning occupant survivability in transport aircraft operating as air carriers, appears responsive to the SAFER Committee recommendation. FAA regional offices will review the form and provide comments to headquarters. A consolidated response to the Board will be provided once the regional comments are received and reviewed.

CRASH SCENARIO DEFINITION. The FAA is establishing aircraft crash scenarios with increased emphasis on post-crash fuel system damage and the effects on cabin fire safety. A number of scenarios have been defined and selection will be completed in 1981. The development of an analytical method to introduce the crash scenario loads into a given design constitutes a major effort. This program must also include means to determine loads imparted to fuselage, seats, and other aircraft components. The development and validation of such a method will require research into the year 1985.

CRASH RESISTANT FUSELAGE FUEL SYSTEM. The FAA plans to establish feasibility of crash resistant fuselage fuel system design criteria for transport category aircraft by the end of 1985.

CABIN MATERIALS. The FAA has completed a series of tests necessary to establish the contribution of current interior cabin materials to the post-crash fire hazard. We are now in the process of evaluating the results of these tests.

SEAT FIRE BLOCKING LAYER CONCEPT. We have made substantial progress on fire blocking layers for seat cushions. Several prototype cushions have been constructed and the merits of the concept have been confirmed by full scale fire tests. We are developing the performance criteria necessary for incorporation of this technology into industrywide standard practices.

DEVELOPMENT OF OHIO STATE UNIVERSITY (OSU) BURN CHAMBER. We have completed a portion of the modification of the OSU test apparatus necessary for adaption to aircraft materials. We expect to complete the modification by March 1982. After that, we will begin a cooperative effort with other laboratories for standardization of the test.

TOXICITY RESEARCH. The FAA has already established an ongoing toxicity research program to establish short-term gas limits for humans as part of an integrated cabin fire safety program. This is a complex and difficult task, but results should provide insight in the selection of interior cabin materials to improve occupant survivability under post-crash fire conditions.

TEST FOR DRIP AND MELT CABIN MATERIALS. The American Society for Testing and Materials (ASTM), in cooperation with the FAA and industry, is developing a modification to the Bunsen burner test to account for materials which melt and drip in testing. We expect to be in a position to consider a regulatory change to incorporate these tests in about 2 years.

US Department
of Transportation

**Federal Aviation
Administration**

September 2, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

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FULL SCALE FIRE TEST PLAN. Correlation of small to large scale tests will follow completion of the small scale test apparatus and procedure.

FIRE MODELING CAPABILITY. The FAA has completed initial development of a post-crash aircraft fire mathematical model. This model requires refinement, scheduled to be accomplished in 1982, and test validation prior to being available as an aid in the selection of interior cabin materials.

HEAT RESISTANT EVACUATION SLIDES. The FAA is currently establishing radiant heat standards for evacuation slides. The applicable technical standard order will be revised to include the new standards.

FIRE RESISTANT WINDOWS. The FAA will conduct full scale fire tests of prototype window assemblies resulting from NASA's research program later this year. These windows are one product being developed under an FAA/NTSB Interagency Agreement to provide more fire resistant aircraft cabin materials, aimed at improving aircraft safety.

OPEN FORUMS ON TOXICITY. The FAA has historically encouraged public participation in agency matters, including the complex subject of material toxicology. Recent examples of this type of information exchange are the public meetings outlined in the preface of the enclosed report FAA-ASF-80-4, "Special Aviation Fire and Explosion Reduction (SAFER) Advisory Committee, Final Report, Volume I." These meetings contributed to the development of Chapter IV, Toxicity and Smoke, of this report. We will continue to function under this "open forum" philosophy.

CABIN MATERIALS. We will continue to support the development of advanced materials to reduce hazards associated with burning cabin materials, including evaluation of the feasibility of establishing a cabin material data bank.

All SAFER Advisory Committee recommendations have been incorporated in the agency's research program plans. As revised editions of relevant program plans are issued by the FAA, copies will be provided to the Board so that you may follow the progress of the programs related to the SAFER recommendations.

Sincerely,

Helms

J. Lynn Helms
Administrator

Enclosure

DRAFT

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendation A-71-59 issued November 12, 1971, and supplements our most recent letter of February 7, 1979. This also responds to your letter of April 10, 1981, in which you requested a further progress report regarding actions to be taken by the Special Aviation Fire and Explosion Reduction (SAFER) Advisory Committee

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FAA Comment. All of the SAFER recommendations are under active study by the FAA. Some require further research or development. In all cases mc analyses are required to determine the most cost effective means of accomplishing the safety objectives of these recommendations. It is premature at this time to determine which recommendations will be addres by regulatory amendment and which will be addressed by non-regulatory alternatives.

The FAA will continue to keep the Board informed of significant progress regarding Safety Recommendation A-71-59.

Sincerely,

Office of the Chairman

National Transportation Safety Board

Washington D C 20594

Office of the Chairman

JAN 16 1981

Honorable J. Lynn Helms
Administrator Designate
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Please refer to the Federal Aviation Administration (FAA) letter of February 7, 1979, and the National Transportation Safety Board followup letter of March 16, 1979, concerning Safety Recommendation A-71-59.

The FAA's letter indicated that the Special Aviation Fire and Explosion Reduction (SAFER) Advisory Committee would report to the Administrator by June 1980 concerning courses of action to minimize postcrash injuries and that the Safety Board would be kept advised of the progress of these efforts. In order to evaluate the present status of this recommendation and update the public docket, we would appreciate a further progress report.

Sincerely yours,

James B. King
Chairman

Office of the Chairman

National Transportation Safety Board

Washington D.C. 20591

March 16, 1979

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Thank you for your letter of February 7, 1979, providing us with an updated status report on recommendation A-71-59. This recommendation was submitted because of our concern at the number of fatalities and injuries due to fire in otherwise survivable accidents.

The National Transportation Safety Board has taken note of the many projects undertaken by the Federal Aviation Administration to reduce the postcrash fire and explosion hazard. We will view with interest the activities of the Special Aviation Fire and Explosion Reduction (SAFER) Advisory Committee, and we would appreciate being provided with updated status reports. This recommendation continues to be maintained in an "Open - Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

February 7, 1979

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to your letter of December 13, 1978, which requests a progress report on Safety Recommendation A-71-59.

The public hearing to which our May 6, 1977, letter referred, was held on June 13 through June 16, 1977. The FAA concluded from the evidence presented at the hearing that the liquid nitrogen fuel tank inerting system, the reticulated polyurethane foam fuel tank filler, or the explosion suppression system cited in Notice of Proposed Rule Making (NPRM) 74-16, could possibly prevent fires in undamaged fuel systems, but would not prevent external fires caused by ignition of fuel released from damaged fuel tanks under postcrash conditions. Of the three systems mentioned, we concluded that a nitrogen fuel tank inerting system may hold the most promise for in-flight protection if problems of weight, logistics and servicing can be resolved.

The FAA withdrew NPRM 74-16 on August 15, 1978, because issuance of a final rule would have been premature in view of the need for additional development of promising systems, such as the onboard nitrogen generating fuel tank inerting system and on an anti-misting fuel which could reduce the postcrash fire hazard from ruptured tanks. The FAA is now pursuing these and other concepts in a high priority research and testing program.

The Special Aviation Fire and Explosion Reduction (SAFER) Advisory Committee was established coincident with the withdrawal of NPRM 74-16. This Committee, composed of government and industry representatives, will guide and monitor the research and development efforts and recommend ways to improve survivability in the postcrash environment. It is composed of an executive director, steering and technical committees.

Committee members have been nominated. The first meeting is tentatively planned for April or May of this year. Present plans are for three to four meetings each year. The Committee will terminate in June 1980, unless it is extended. Members of the NTSB staff have responded to invitations for membership. Their participation will be welcomed.

The goal of the Committee is to develop a report to the Administrator by June 1980 concerning courses of action which should be taken to minimize postcrash injuries by implementing actions to direct or redirect new or in-being research and to undertake rule making as appropriate.

We will continue to keep you advised of the progress of these efforts.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

Office of the
Chairman

National Transportation Safety Board

Washington D.C. 20591

13 DEC 1978

Honorable Langhorne Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

This is to request a progress report on Safety Recommendation A-71-59 issued November 12, 1971. The recommendation emanated from the investigation of Allegheny Airlines, Convair 580 accident at New Haven, Connecticut, on June 7, 1971, and the Capitol International Airways, DC-8 accident at Anchorage, Alaska, on November 27, 1970. The Safety Board recommended that:

> "The Federal Aviation Administration initiate action to incorporate in its airworthiness requirements, a provision for fuel system fire safety devices which will be effective in the prevention and control of both in-flight and postcrash fuel system fires and explosions. It is further recommended that rulemaking action in this matter specifically apply to future passenger-carrying aircraft in the transport category, and that consideration be given to an adaptation to all other passenger-carrying aircraft now in service."

The FAA's last letter of May 6, 1977, made reference to a proposed public hearing on the subject, which was subsequently held on June 13 through June 24, 1978. Reference was also made to NPRM 74-16, which has since been withdrawn (Federal Register 9/24/78).

Notwithstanding the magnitude and complexity of the problem, we urge the FAA to continue to give high priority to this recommendation. Also for the public docket record and our own information, we would appreciate an updated status report.

Sincerely yours,

James B. King

James B. King
Chairman

RECEIVED

Office of
Chairman

National Transportation
Safety Board

Washington, D.C. 20594

June 7, 1977

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D. C. 20591

Dear Mr. Bond:

This is in response to your letter of May 6, 1977, which outlined the progress made by the Federal Aviation Administration (FAA) in implementing Safety Recommendation A-71-59, which was issued by the National Transportation Safety Board on November 19, 1971.

The Safety Board has reviewed the comments received by the FAA in response to Notice of Proposed Rule Making (NPRM) 74-16. We reviewed also our recommendation files for any additional material that might be of benefit to the FAA in this important aspect of aviation safety. While the Safety Board currently has no further inputs to offer beyond its previous recommendations on fire safety, we are encouraged by and commend highly the steps taken by the FAA in convening a public hearing on this subject.

The Safety Board is looking forward to attending the hearing on fire and explosion hazard reduction on June 13 through 17, and we plan to submit a position paper by August 1.

Sincerely yours,

Webster B. Todd, Jr.
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

May 6, 1977

Honorable Webster B. Todd, Jr.
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is an updating of progress in implementing Safety Recommendation A-71-59, which called for the Federal Aviation Administration (FAA) to ". . . initiate action to incorporate in its airworthiness requirements a provision for fuel system safety devices which will be effective in the prevention and control of both in-flight and postcrash fuel system fires and explosions . . ."

FAA Notice of Proposed Rule Making (NPRM) No. 74-16 is directly related to this subject. The numerous comments in response to the NPRM have been under review by the FAA. Some commenters argued that the proposed requirements would have little or no effect in reducing the hazards of impact-survivable airplane accidents when the fuel system integrity is breached. Some commenters claimed that the problems the proposed requirements were trying to solve could be more efficiently and effectively accomplished by other means.

The FAA believes that a public hearing would provide a forum to obtain additional information which would help determine the proper course of action on this and related matters. Therefore, the FAA has scheduled a public hearing from June 13 to June 17, 1977, as officially announced and described in the April 25, 1977, Federal Register.

Sincerely,

Quentin S. Taylor

Quentin S. Taylor
Deputy Administrator

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20590

OFFICE OF THE ADMINISTRATOR

1971

Honorable John H. Reed
Chairman, National Transportation Safety Board
Department of Transportation
Washington, D.C. 20591

Dear Mr. Chairman:

This will respond to your Safety Recommendation A-71-59 adopted 3 November 1971 concerning safety devices for enhancing survivability during in-flight and postcrash fires.

Your recommendation deals with the specific goal of preventing and controlling fuel system fires and explosions. We have been working toward this safety objective, recognizing that protection against the occurrence of fire and explosion, whatever the ignition source, would be an important safety improvement.

A key element in our program is the operational evaluation of a protective system in our DC-9 aircraft being utilized for pilot training. Shortly after 1 January 1972, it is anticipated that the accumulated data and information on system reliability, maintainability, and operating costs will be reviewed and discussed with interested industry segments under the auspices of the Advisory Committee on Fuel System Fire Safety. We welcome participation by members of your staff.

Following these coordinating actions, we will develop a course of action regarding rule promulgation, both with respect to new transport category aircraft and passenger-carrying aircraft in service.

Sincerely,

...TOR

cc:

UNITED STATES OF AMERICA
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: November 12, 1971

Adopted by the NATIONAL TRANSPORTATION SAFETY BOARD
at its office in Washington, D. C.
on the 3rd day of November 1971

FORWARDED TO:
Honorable John H. Shaffer
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION A-71-59

During public hearings which were convened in the matter of the Allegheny Airlines and Capitol International Airways accidents, the National Transportation Safety Board obtained extensive expert testimony from the Federal Aviation Administration and from the U.S. Army Mobility Research Laboratory Staff pertaining to the technological advances in the field of in-flight and postcrash fuel system fire safety. The Board is most encourged by these advances and the capability of industry to apply this technology to present and future aircraft.

Technology available today provides a wide scope of improvements in the fuel system fire safety field. Some systems, oriented primarily toward prevention of postcrash fires, are in successful use by the U.S. Army and have saved untold numbers of lives. Other systems such as the Parker liquid nitrogen fuel tank inerting system is most effective in preventing fuel system vapor explosions with the fuel tank system relatively intact.

The Safety Board is aware of the concerted efforts and programs that the Federal Aviation Administration has been engaged in over the past 8 years to promote the development of various explosion and fire prevention systems. The Board has on a regular basis observed, and highly commends the activities of the Advisory Committee on Fuel System Fire Safety which is operating under the chairmanship of Mr. Robert Auburn of your Flight Standards Service. We feel that significant advances in the field of both in-flight and postcrash fuel system fire

safety have been made as a result of this committee's work as well as the research and experience gained by the U.S. Army. Particularly encouraging is the operation of your DC-9 aircraft with an operationally functional explosion/fire suppression system.

Our current investigation of an accident involving an Allegheny Airlines Convair 580, N5832, which occurred at New Haven, Connecticut, on June 7, 1971, produced evidence that possibly as many as 27 of the 28 persons fatally injured survived the initial crash impact. We have witness reports and corroborative medical data to show that time for a successful evacuation of survivors was drastically limited by fire and smoke as well as by explosions which rapidly expanded the fire.

A similar obstacle to survival was found to be present in the case of a takeoff accident involving Capitol International Airways, Douglas DC-8-63, N4909C, at Anchorage, Alaska, on November 27, 1970. Forty-seven of the 229 persons aboard this aircraft perished. Again in this case, initial crash injuries were of a survivable nature, but the inability to escape the rapidly propagating fire proved fatal.

The Board, therefore, recommends that:

> The Federal Aviation Administration initiate action to incorporate in its airworthiness requirements, a provision for fuel system fire safety devices which will be effective in the prevention and control of both in-flight and postcrash fuel system fires and explosions. It is further recommended that rulemaking action in this matter specifically apply to future passenger-carrying aircraft in the transport category, and that consideration be given to an adaptation to all other passenger-carrying aircraft now in service.

This recommendation will be released to the public on the issue date shown above. No public dissemination of the contents of this document should be made prior to that date.

Reed, Chairman; Laurel, Thayer, and Burgess, Members, concurred in the above recommendation; McAdams, Member, dissented.

John H. Reed

By: John H. Reed
Chairman

US Department
of Transportation

**Federal Aviation
Administration**

September 10, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendations A-79-58 and A-79-59 issued July 19, 1979, and supplements our letter of October 12, 1979. By letter dated November 7, 1979, both of these recommendations were classified in an "Open—Acceptable Action" status. This also responds to your letter of October 15, 1980, in which you requested an updated status report.

A-79-58. Issue an Airworthiness Directive to require that sequencing nose gear doors are installed on all DASH 7 aircraft and to require that the sequencing nose gear door systems be operational for all flights during which ice or snow could accumulate in the nose wheel well.

FAA Comment. On March 16, 1981, Transport Canada confirmed to the Federal Aviation Administration (FAA) that DHC-7 aircraft Serial No. 3 and subsequent aircraft have been modified. This modification was accomplished either by the retrofit of DHC Modification 7/1343 or by the incorporation of Customer Special Installation CS1 78014. Serial No. 1 and 2 are the prototype test aircraft at DeHavilland. The Canadian authorities have issued an Airworthiness Directive making either Modification 7/1343 or CS1 78014 mandatory. In our letter of October 12, 1979, the Board was informed that all DHC-7's registered in the U.S. at that time had been modified, and that procedures requiring the sequencing nose gear doors to be operational had been adopted. In consideration of this action, i.e., all DHC-7's (except two prototypes) having been modified with sequencing nose gear door systems and the requirement that these systems be operational, the FAA considers action on Safety Recommendation A-79-58 completed.

A-79-59. Review and revise as necessary the aircraft emergency procedures section of the DASH 7 flight manual to include information on use of the emergency cabin pressurization outflow valve to divert warm cockpit air to the nose gear wheel when icing is suspected.

FAA Comment. The Canadian authorities have informed us that the nose gear closing system, addressed in our response to A-79-58, effectively prevents accumulation of ice and slush in the nose wheel bay. In the absence of reports to the contrary, we agree with the Canadian authorities and have, therefore, determined that additional action is unnecessary. Accordingly, the FAA considers action on Safety Recommendation A-79-59 completed.

Sincerely,

J. Lynn Helms
Administrator

Office of the
Chairman

National Transportation Safety Board

Washington D.C. 20594

October 15, 1980

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond·

Please refer to National Transportation Safety Board Safety Recommendations A-79-58 and 59 issued July 19, 1979. These recommendations stemmed from our investigation of a Rocky Mountain Airways DHC Dash 7 accident at Stapleton International Airport, Denver, Colorado, on March 3, 1979.

By letter dated November 7, 1979, we informed you that we were keeping these recommendations in an "Open--Acceptable Action" status pending their final resolution. In order to evaluate the progress of these recommendations and update the public docket, we would appreciate an updated status report.

Sincerely yours,

James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of Chairman

November 7, 1979

Honorable Langhorne Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Thank you for your letter of October 12, 1979, responding to the National Transportation Safety Board's Safety Recommendations A-79-58 and 59. These recommendations stemmed from our investigation of a Rocky Mountain Airways DHC Dash 7 accident at Stapleton International Airport, Denver, Colorado, on March 3, 1979. The nose wheel door froze in the closed position, which prevented the nose wheel from extending.

In A-79-58 we recommended that the Federal Aviation Administration (FAA) issue an Airworthiness Directive (AD) to require that sequencing nose gear doors be installed on all Dash 7 aircraft. We are pleased to note that all Dash 7 aircraft registered in the U.S. have been modified with sequencing nose gear doors. We also note that, to preclude the possibility of an unmodified airplane coming into the U.S. registry, the FAA will issue an AD requiring the modification. Pending the issuance of the AD, A-79-58 is being maintained in an "Open--Acceptable Action" status.

In A-79-59 we recommended the diversion of warm cockpit air to the nose wheel when icing is suspected and the inclusion of such information in the flight manual. We understand that this recommendation is being studied by DeHavilland of Canada. Pending the manufacturer's final determination, A-79-59 is also being maintained in an "Open--Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

OCT 12 1979

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-79-58 and 59.

A-79-58. Issue an Airworthiness Directive to require that sequencing nose gear doors are installed on all DASH 7 aircraft and to require that the sequencing nose gear door systems be operational for all flights during which ice or snow could accumulate in the nose wheel well.

Comment. Transport Canada has advised the Federal Aviation Administration (FAA) that the owners of two DHC-7 airplanes, not U.S. registered and not based on this continent, have not responded concerning the retrofit of nose wheel door automatic sequencing. Accordingly, Transport Canada plans to issue an airworthiness directive (AD). To preclude the possibility of an unmodified airplane coming into the U.S. registry, the FAA will issue an AD requiring the modification. The airplanes presently registered in the U.S. have been modified and procedures requiring the sequencing nose gear doors to be operational have been adopted.

A-79-59. Review and revise as necessary the aircraft emergency procedures section of the DASH 7 flight manual to include information on use of the emergency cabin pressurization outflow valve to divert warm cockpit air to the nose gear wheel when icing is suspected.

Comment. We have been advised by Transport Canada that this recommendation requires further study by DeHavilland. The adequacy of the warm air to melt accumulated ice is dependent on many factors. At this time data upon which a determination could be made are not available.

We will advise when a decision has been made.

Sincerely,

[Signed] Langhorne Bond
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 19, 1979

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)
A-79-58 and -59

On March 3, 1979, Rocky Mountain Airways Flight 726, a DeHavilland DASH 7, N27RM, landed at Stapleton International Airport, Denver, Colorado, with the nose landing gear retracted. As a result, the lower forward nose section was damaged slightly, but the 3 crewmembers and 49 passengers aboard were not injured. The National Transportation Safety Board's investigation of this incident revealed that accumulated ice in the nose wheel well had caused the gear doors to freeze shut and prevented the nose gear from extending. Investigation also disclosed possible inadequacies in the design of the DASH 7's nose gear system and in the emergency procedures section of the DASH 7 flight manual. The Safety Board believes that the Federal Aviation Administration should take action to preclude the possibility of similar failures.

The aircraft departed Stapleton International Airport at 1941 m.s.t., on a scheduled passenger flight to Aspen, Colorado. When the landing gear handle was lowered for landing at Aspen, the main gear position lights indicated "green" (down) and the nose gear position light indicated "in transient" (unsafe). The pilots recycled the gear and accomplished all of the DASH 7 flight manual emergency landing gear extension procedures; however, the nose gear remained up.

The aircraft returned to the Denver area; and after the pilots consulted with company officials, a decision was made to land nose gear up. The passengers were briefed for an emergency landing, and the aircraft was landed at Stapleton International Airport at 2220 m.s.t.

The ice and slush accumulation in the nose wheel well came from snow and slush covered taxiways and runways at airports where the aircraft had operated earlier in the day. The pilots stated that the accumulation of ice and slush observed on preflight did not appear to be significant. The aircraft was moved from the runway to a hanger and

placed on jacks. The landing gear was cycled repeatedly using the normal and emergency systems with no mechanical failures or discrepancies noted. The investigation team concluded that the nose gear failed to extend because of ice which had frozen the gear doors in the closed position.

The Safety Board's investigation also found two other means by which this incident might have been prevented:

(1) The original design of the DASH 7 permitted the nose gear doors to remain open when the nose gear was down. A kit was provided by DeHavilland in the fall of 1978 to modify the system to close the nose gear doors after the nose gear was extended. The modification was specifically designed to prevent ice and slush from accumulating in the nose wheel well during ground operation. On the accident aircraft the hydraulic actuator for the nose gear door sequencing system developed a leak on February 10, 1979. (DASH 7's manufactured before serial No. 13 do not have such a system.) Since the sequencing system was not a "required" item and replacement parts were not available, the system was disabled and the aircraft continued in service.

The Safety Board believes that the sequencing nose gear door system would have prevented ice and slush from entering the wheel well had it been installed and operational. Therefore, the sequencing door system should be installed on all DASH 7 aircraft and should be operational for all flights where ice and snow might possibly accumulate in the nose wheel well.

During the investigation, Rocky Mountain Airways executives agreed that the sequencing nose gear system should be mandatory equipment for flight operations on snow or slush covered runways or in icing conditions. As a result, Rocky Mountain Airways immediately instituted changes in its maintenance program.

(2) The DASH 7 aircraft has an emergency cabin pressurization outflow valve located in the nose wheel well which is used as a backup to the normal automatic pressurization outflow valves in the aft part of the aircraft and for emergency smoke elimination from the cabin. The pilots control the valve manually; and, if opened in flight, heated cabin air will flow into the nose wheel well and may melt any accumulation of ice. This melting of ice could allow the nose gear doors to open. This procedure is not in the DASH 7 flight manual or any other publication.

The Safety Board believes that the emergency procedures section of the DASH 7 flight manual should be revised to include procedures for opening the emergency outflow valve if ice accumulation is suspected. Rocky Mountain Airways revised its DASH 7 emergency procedures checklist to include such a procedure.

In view of the above, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Airworthiness Directive to require that sequencing nose gear doors are installed on all DASH 7 aircraft and to require that the sequencing nose gear door systems be operational for all flights during which ice or snow could accumulate in the nose wheel well. (A-79-58) (Class I -- Urgent Action)

> Review and revise as necessary the aircraft emergency procedures section of the DASH 7 flight manual to include information on use of the emergency cabin pressurization outflow valve to divert warm cockpit air to the nose gear wheel when icing is suspected. (A-79-59) (Class I -- Urgent Action)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS and GOLDMAN, Members, concurred in these recommendations.

James B. King

By: James B. King
Chairman

U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave S W
Washington D C 2059

September 18, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This letter updates the status of actions taken on several NTSB safety recommendations relative to crewmember flight and duty time limitations and rest requirements.

A-72-55. The Federal Aviation Administration revise FAR 135 to provide adequate flight and duty time limitations.

A-72-178. Amend FAR 135.136 to provide for daily, weekly and monthly flight and duty time limitations.

A-72-179. Amend FAR 135.136 to provide that all flying, including private, shall not exceed the prescribed flight and time limitations.

A-79-81. Expedite rulemaking which would make the flight time and duty time limitations, and rest requirements for commuter air carriers the same as those specified for domestic air carrier crewmembers under 14 CFR 121.

FAA Comment. The Federal Aviation Administration (FAA) has issued several notices and a supplemental notice proposing substantial changes to the flight and duty time limitations and rest requirements for flight crewmembers serving with the following categories of operators: domestic, flag, and supplemental air carriers, commercial operators of large aircraft, commuter airlines, other air taxi operators, and commercial operators. The comments received in response to these notices have been extensive and generally negative.

The FAA analysis of these comments reveals three significant facts: First, both the existing and proposed rules reflect a level of complexity and detail that calls into question whether or not they represent an appropriate exercise of the safety regulatory responsibility of the FAA. Second, the cost demands resulting from rulemaking for both large and small air carriers would impact heavily on the air carrier industry which is already suffering serious financial burdens. Third, the whole broad subject of crewmember flight and duty time is highly controversial.

Section 601(a)(5) of the Federal Aviation Act of 1958 (49 U.S.C. 1421) requires the FAA to issue "Reasonable rules and regulations governing, in the interest of safety, the maximum hours or periods of service of airmen, and other employees, of air carriers." This mandate has constituted law since 1938, when the Civil Aeronautics Act was passed. Since then, the rules implementing that law have not changed in any significant way. The change in the aviation industry, on the other hand, has been vast and extensive.

On February 17, 1981, the President issued Executive Order 12291 on "Federal Regulations" (46 FR 13193; February 19, 1981). Section 2 of the Executive Order specifies five general requirements for the rulemaking conducted by the Federal Government. These requirements will guide the FAA rulemaking activity over the coming years. Considering FAA's statutory mandate and Executive Order 12291, I have concluded that the pending rulemaking action should be withdrawn, and the withdrawal notice of May 8, 1981, is enclosed. My staff will reassess the FAA safety role in this area, and an approach will be established that defines the FAA responsibility for regulating safety in air transportation. Other issues, relative to labor-management relations will be directed to unions and the airline companies for resolution.

Sincerely,

Helms

J. Lynn Helms
Administrator

Enclosure

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

FEB 20 9:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Weithoner:

Reference is made to the Federal Aviation Administration (FAA) letter dated November 6, 1980, responding to National Transportation Safety Board Safety Recommendations A-79-80 and -81, A-78-27 through -29, and A-80-64 through -75. This letter is in reply to your response to our reiterated recommendations A-79-80 and -81. Our comments on your response dealing with A-78-27 and -29 and A-80-64 through -75 are being forwarded in separate letters.

In Safety Recommendation A-79-80 we proposed that the FAA require that pilots involved in 14 CFR 135 operations be thoroughly trained on the performance capabilities and handling qualities of aircraft when loaded to their maximum certificated gross weight or to the limits of their center of gravity envelope, or both. We have examined the new Federal Aviation Regulations Section 135.244, Operating Experience, effective March 1, 1980. Although this new regulation upgrades the experience of a pilot-in-command, no specific mention is made of a pilot's handling of an aircraft loaded to maximum gross weight. Instances of twin engine aircraft crashing during takeoff, after the failure of one engine, occur too frequently. The manner in which a pilot should be trained to respond to such emergencies is unclear. We request the FAA to fulfill the intent of this recommendation in a clear and positive manner. Pending its resolution, A-79-80 will be maintained in an "Open--Unacceptable Action" status.

In Safety Recommendation A-79-81 we asked the FAA to expedite rulemaking which would make the flight time and duty time limitations and the rest requirements for commuter air carriers the same as those specified for domestic air crewmembers under 14 CFR 121. We appreciate the rulemaking actions underway to fulfill this recommendation which we are maintaining in an "Open--Acceptable Action" status.

Sincerely yours,

James B. King

James B. King
Chairman

X

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF THE ADMINISTRATOR

November 6, 1980

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations, relating to Commuter Airline operations, issued by the Board on August 8, 1980. These recommendations resulted from the Board's special investigation of the commuter industry and the elements which affect commuter airline safety. The objectives of these recommendations, for the most part, were within the scope of existing FAA programs.

As a result of its study, the National Transportation Safety Board reiterated five previously issued recommendations to the Federal Aviation Administration. The Board had been earlier advised of actions underway with respect to these recommendations. Many of these actions were developed as the result of the implementation and the issuance of amendments to Part 135 of the FAR's published at various times during calendar year 1980, or as the resolution of issues or concerns discussed during the FAA's First Commuter Air Carrier Safety Symposium held January 16 and 17, 1980. The adequacy of these actions, and other regional programs directed to commuter safety, will again be addressed at the second symposium to be held January 16 and 17, 1981. The current status of these actions is as follows:

A-79-80. Require that pilots involved in 14 CFR 135 operations be thoroughly trained on the performance capabilities and handling qualities of aircraft when loaded to their maximum certificated gross weight or to the limits of their c.g. envelope, or both.

Comment. As stated in our letter to the NTSB dated August 27, 1980, regulatory action was deemed appropriate, and, in fact, has been accomplished by the issuance of new FAR Section 135.244, Operating Experience, effective March 1, 1980. We believe the addition of this

requirement will further ensure that pilots involved in commuter operations are adequately trained in all pertinent operational areas, one of which includes aircraft handling characteristics at maximum takeoff gross weights. The FAA considers action on Safety Recommendation A-79-80 completed.

A-79-81. Expedite rulemaking which would make the flight time and duty time limitations, and rest requirements for commuter air carriers the same as those specified for domestic air crewmembers under 14 CFR 121.

Comment. Work on this project is continuing. A supplemental notice of proposed rule making was issued on August 11, 1980, (Notice No. 78-3B, copy enclosed). This supplemental notice proposes to revise the flight and duty time limitations and rest requirements for flight crewmembers utilized by domestic, flag, and supplemental air carriers, commercial operators, and air taxi operators. This supplemental notice is based upon two notices of proposed rule making issued in 1977 and 1978 as part of the FAA's Regulatory Review Program.

Preliminary FAA analysis of the comments received on the earlier notices (and specifically Notice 78-3) indicated the need for intensive review and additional conceptual development before that rulemaking action could proceed. Consequently, in view of the conceptual similarity between the flight and duty time limitations proposed in Part 135 and the proposal in Notice 78-3, when the agency issued the amendments to Part 135, it was decided to defer changing the flight and duty time limitations in Part 135 until they could be given further consideration. Accordingly, this supplemental notice proposes changes to both Part 121 and Part 135 and includes a discussion of comments received in response to Notices 78-3 and 77-17 pertaining to flight and duty time limitations.

A-78-27. Develop, in cooperation with industry, flight recorder standards (FDR/CVR) for complex aircraft which are predicated upon intended aircraft usage.

Comment. We recently updated the status of this safety recommendation in our letter of July 29, 1980. To reiterate our remarks, during August 1979 FAA received a proposed standard for a composite cockpit voice recorder/flight data recorder (CVR/FDR) from one of the major manufacturers of both CVR's and FDR's. Working with this proposed standard and other sample standards as a base, FAA has developed a proposed draft standard for a composite CVR/FDR. A new public procedure to expedite the issuance of standards for specified materials, parts, processes, and appliances used on civil aircraft was issued by FAA on June 2, 1980, with September 9 as its effective date (copy enclosed). FAA will publish its proposed standard for a composite CVR/FDR under this new procedure. A copy of the latest draft of the CVR/FDR and a copy of

draft of the CVR/FDR Standard and a copy of the new TSO procedures are enclosed. As a result of a recent NTSB recommendation, FAA is requesting SAE to develop the standard from our draft material.

A-78-28. Draft specifications and fund research and development for a low cost FDR, CVR, and composite recorder which can be used on complex general aviation aircraft. Establish guidelines for these recorders, such as maximum cost, compatible with the cost of the airplane on which they will be installed and with the use for which the airplane is intended.

Comment. The status of this recommendation was also updated in our letter of July 29, 1980. Although initially the FAA had planned to establish a regulatory project to develop an Advance Notice of Proposed Rule Making (ANPRM) for identification of appropriate standards, further review of the matter indicated that this regulatory procedure was not necessary. Research and development previously accomplished by the U.S. Army and by NASA was already being incorporated by several equipment manufacturers in their own development plans.

A-78-29. In the interim, amend 14 CFR to require that no operation (except for maintenance ferry flights) may be conducted with turbine-powered aircraft certificated to carry six passengers or more, which require two pilots by their certificate, without an operable CVR capable of retaining at least 10 minutes of intracockpit conversation when power is interrupted. Such requirements can be met with available equipment to facilitate rapid implementation of this requirement.

Comment. We also updated the status of this recommendation in our July 29, 1980, letter as follows: "In partial fulfillment of this recommendation, 14 CFR 135 was amended, as published October 10, 1978, in Vol. 43 FR 46742, to require under Section 135.151 (copy enclosed) that no person may operate a turbojet airplane having a passenger seating configuration, excluding any pilot seat, of 10 seats or more, unless it is equipped with an approved cockpit voice recorder.

"In further fulfillment of this recommendation, the FAA currently is drafting an NPRM which would require under Part 91, General Operating and Flight Rules, several additional equipment items, including a CVR on all multiengine turbojet airplanes. This would expand the coverage under Section 135.151 since there would be no minimum seating requirement specified." The FAA will continue to keep the Board advised of progress relating to these recommendations.

In addition to reiterating these five recommendations, the Board made twelve additional recommendations. The Board was previously advised that the FAA had initiated or completed actions which satisfied the intent of several of these safety recommendations.

A-80-64. Establish a separate classification of commuter airline inspectors to conduct commuter airline surveillance.

Comment. A separate classification was established within the FAA GS-1825 classification guide well in advance of the issuance of this recommendation. This classification for Principal Aviation Safety Inspectors emphasizes experience requirements for the certification and surveillance of commuter airlines. This guide is currently being used in the job classification of these inspectors. (A copy of the applicable announcements are enclosed.) We consider action on Safety Recommendation A-80-64 completed.

A-80-65. Provide specialized training for inspectors assigned to commuter airlines to insure that inspectors are qualified in the equipment operated and are knowledgeable regarding commuter airline operations.

Comment. The FAA agrees with this recommendation and has initiated additional training courses for this purpose. Specialized training is being provided for inspectors assigned to commuter airlines at the Mike Monroney Aeronautical Center at Oklahoma City. Course 21618, Air Carrier Airworthiness Indoctrination (ACAI), is for general aviation inspectors and is made up of selected subjects from the air carrier inspectors indoctrination course. It was initiated in FY-79 in response to revised Part 135. Eighty inspectors completed this course in FY-79/80 and 16 inspectors are scheduled for FY-81. The second, Course 21828, Air Taxi Certification and Surveillance, covers certification requirements, operating rules, aircraft, equipment, policies, and procedures. This course was developed for airworthiness inspectors assigned to commuter airlines. In FY-79/80, the FAA trained 48 inspectors in Course 21828 and 36 inspectors are scheduled for FY-81. There are two courses for operational inspectors: Course 22100, Air Taxi Operations Certification and Inspection; and Course 21617, Air Carrier Mini Indoctrination. One hundred and seventy inspectors completed Course 22100 in FY-79/80 and 40 inspectors completed Course 21617 in FY-80 (the first year that this course was offered). For FY-81, Course 22100 has 70 inspectors scheduled for attendance and Course 21617 has 36 inspectors scheduled. With regard to flight training and qualifications, a continuing effort is being made to qualify all commuter inspectors in at least one turboprop aircraft and, where applicable, specific turbojet aircraft under their surveillance. This should be viewed as a continuing program due to such factors as manpower and fiscal restraints and personnel turnover. The FAA considers action on Safety Recommendation A-80-65 completed.

A-80-66. Allocate GADO resources to insure that all commuter surveillance and general aviation requirements can be accomplished.

Comment. 127 Flight Standards Aviation Safety Inspector positions were allocated for the FY 1981 budget appropriation. Due to a pressing need, 50 of these positions were advanced to the FY 1980 budget, and these positions have all been filled. The additional 77 positions will be filled during FY 1981. All of the 127 positions are dedicated to commuter/air taxi certification and surveillance activities. The FAA considers action on Safety Recommendation A-80-66 completed.

A-80-67. Establish a procedure for distributing surveillance of commuter airline maintenance evenly during all periods when maintenance is performed.

Comment. The FAA is in agreement with the intent of this recommendation and we believe it will be satisfied by events in progress. Work assignments for inspectors is a function of district office supervision, which provides the greatest flexibility for effective utilization of those personnel. The headquarters and regional offices periodically emphasize the need for specific surveillance by notices, such as N 8000.198, Increased Surveillance for Operator Under New Part 135 (copy enclosed).

Inspector personnel assigned to commuters have borne a time-consuming workload in the recertification of those operators under the new Part 135. With this workload behind us and hiring of new inspectors for commuter assignments now in progress, coupled with the commuter-oriented inspector programs, sufficient inspector manpower should be provided to accommodate scheduling off-hour surveillance of commuter maintenance activities. We will keep the Board advised of the results of our efforts in this regard.

A-80-68. Require that only actual passenger weights be used in weight and balance computations for reciprocative engine aircraft used in Part 135 flights which are certificated for nine or less passengers.

Comment. This was accomplished on an interim basis by internal notices culminating April 1, 1980. Final implementation of this recommendation is by Advisory Circular, AC 120-27A, Weight and Balance Control, issued May 14, 1980, and by internal instructions to FAA airworthiness inspectors, which are under development. The thrust of FAA's efforts in this area is to cause the certificate holders to develop suitable weight and balance control systems that can be easily managed by pilots or other personnel responsible for loading, in accordance with methods and procedures provided by the respective certificate holder. The FAA considers action on Safety Recommendation A-80-68 completed.

A-80-69. Amend 14 CFR 135.243 to require a minimum number of multiengine flight hours for a pilot-in-command of a multiengine commuter airline flight.

Comment. In February 1980, new Section 135.244, commuter pilot-in-command operating experience requirements, was issued, which contained standards for pilots prior to designation as pilot-in-command on commuter passenger-carrying operations. These requirements established increased operating experience levels by make and model for both single and multiengine aircraft. This experience, which varies depending on whether the aircraft is piston or turbine powered, must be acquired under the supervision of a check airman employed by the certificate holder in passenger-carrying operations. The intent of this rule is to upgrade

pilot experience to adhere to a higher level of safety. A copy of this new section is enclosed for your review. Also, it should be stressed that this new section specifies requirements in addition to those in Section 135.243, which require all pilots serving in commuter operations to hold an airline transport pilot certificate. This requirement in itself, in our judgment, contributes appreciably to pilot-in-command experience, especially when complemented by the provisions of new Section 135.244. Finally, we believe the increased training program requirements contained in Subpart H of Part 135 are also a positive factor. In this regard, the operating experience under Sections 135.244 must be acquired only after satisfactory completion of the appropriate ground and flight training for the aircraft and crewmember position. Approval provisions for the operating experience must be scheduled in the operator's training program. We consider action on Safety Recommendation A-80-69 completed.

A-80-70. Amend 14 CFR Subpart B to require that dispatch and flight operations duties are supervised by personnel trained in those functions.

Comment. Due to the relative size and scope of Part 135 commuter operations, we do not, at this time, believe there is a need for a flight dispatcher as indicated in Part 121 operations. We will, of course, continue to monitor this situation for possible changes in future operations. With regard to flight operating personnel qualifications and training, we believe the current regulations are adequate. The qualification requirements for supervisory personnel are adequate to achieve the intended level of safety. Section 135.37, Management Personnel Required, requires a qualified director of operations, chief pilot, and director of maintenance. Section 135.39 specifies the qualifications that persons occupying these positions must possess. Also, Section 135.77, Responsibility for Operational Control, requires each certificate holder to list in his operating manual the name and title of each person authorized to exercise operational control. Accordingly, the FAA intends to take no further steps in this area at this time, and we consider action on Safety Recommendation A-80-70 completed.

A-80-71. Amend CFR 135.185 to require that aircraft empty weight, and that center of gravity be determined more frequently.

Comment. The FAA agrees with the intent of this proposal as it regards the importance of aircraft empty weight, operating weight, and corresponding centers of gravity (c.g.). However, we believe a well developed cumulative weight control system is the primary means of controlling operating weight and c.g. This system continuously updates operating weights and c.g.'s (or other aircraft weight references) to account for changes to the aircraft, its equipment, or standard passenger provisions such as stewardess supplies. Periodic reweighing of aircraft under

approved programs serves to confirm the cumulative weight control system. Section 185 provides for the use of approved weight and balance control systems for multiengine aircraft which includes cumulative weight control. These programs include periodic reweighing requirements for aircraft controlled on a fleet basis, as well as aircraft handled individually. In the case of aircraft fleets, aircraft within each fleet are weighed on a sampling basis to confirm the fleet weight and c.g. Therefore, reweighing periodically is imposed on the fleet rather than on individual aircraft.

Advisory Circular 120-27A, Weight and Balance Control, was issued May 18. This circular consolidates previous advisory circulars for air taxis and large air carriers, and includes cumulative weight control procedures as well as aircraft reweigh periods. The superseded advisory circular for air taxis did not include a periodic reweigh period. We do not believe further steps in this area are appropriate at this time and, accordingly, the FAA considers action on Safety Recommendation A-80-71 completed.

A-80-72. Evaluate and revise as appropriate the criteria for the authorization of single-pilot IFR operations for commuter airlines.

Comment. The FAA concurs with Safety Recommendation A-80-72. Section 135.105 was amended, effective March 1, 1980, to require that, prior to authorizing single pilot IFR operations, the pilot-in-command must have previously logged 100 pilot-in-command hours in the make and model aircraft to be flown. This increased pilot experience requirement would ensure that the pilot has aircraft familiarity and proficiency sufficient to adequately cope with IFR operational problems and to handle inflight emergencies. We consider action on Safety Recommendation A-80-72 completed.

A-80-73. Expand the ADAP program to support the development of commuter-served airports.

Comment. In 1976, Amendments to the Airport and Airway Development Act of 1970 defined commuter airports for the first time and provided specific funding for their development. In the administration of the Airport Development Aid Program (ADAP), the FAA, through use of an authorized discretionary fund, has consistently granted more for commuter airport development annually than the $15 million identified in the Act for use at commuter locations (FY 1976, $19.9M; FY 1977, $23.9M; FY 1978, $19.9M; FY 1979, $30.7M; and FY 1980, $21.6M).

The Administration's legislative proposal to continue an airport grant program beyond the September 30, 1980, expiration of the ADAP was developed to provide a single fund for development of all commercial service (including commuter) airports. This will allow greater emphasis to be placed on improvement of commuter airports in the post-1980

program. The latest House and Senate legislative proposals require administration of the facilities and equipment and airport development programs in a manner to maximize the use of safety facilities with highest priority for commercial service airports. This includes, but is not limited to, installation, operation, and maintenance of precision approach systems for each primary runway; grooving or friction treatment of all primary and secondary runways; nonprecision approaches for secondary runways; and electronic or visual vertical guidance on all runways.

We believe the FAA's ADAP program has been administered to support the development of commuter-served airports, and that future programs though subject to legislative approval, have also been designed to support commuter airports, and, accordingly, no further action is presently intended. The FAA, therefore, considers action on Safety Recommendation A-80-73 completed.

A-80-74. Revise the qualifying criteria to insure that a larger percentage of commuter-served airports are equipped with instrument landing systems.

Comment. An extensive evaluation of the instrument landing system (ILS) qualifying criteria was initiated. This evaluation includes a reassessment of the benefits derived from an ILS by all categories of aviation, including trunk carriers, commuter carriers, air taxi carriers, general aviation, and military. Completion of this evaluation is anticipated in the near future. We will advise the Board of the results of this evaluation as soon as they are available.

A-80-75. Insure, to the extent possible, that airports which are served by commuter airlines are equipped with an instrument approach facility.

Comment. In February 1980 the FAA initiated an indepth analysis of all airports served by commuter airlines in the continental U.S. and Hawaii which found that 64 percent have a commissioned or programmed instrument landing system (ILS). Commuter needs at the remaining commuter-served airports are being investigated. Recommendations regarding the installation of ILSs at specific airports are anticipated in the near future and will be made available to the Board when available.

In summary, the FAA considers action completed on Safety Recommendations A-80-64, -65, -66, and -68 through -73. We intend to provide further response to the Board on Recommendations A-80-67, -74, and -75.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

Enclosures

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

August 27, 1980

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to your letter of July 9 and supplements our letter of January 15 to NTSB Safety Recommendations A-79-80 and 81.

A-79-80. Require that pilots involved in 14 CFR 135 operations be thoroughly trained on the performance capabilities and handling qualities of aircraft when loaded to their maximum certificated gross weight or to the limits of their c.g. envelope, or both.

Comment. An amendment to 14 CFR Part 135, Amendment No. 135-3, issued January 30 requiring additional operating experience for commuter pilots-in-command, was effective March 1. A notice providing specific flight testing standards for Part 135 pilots was issued on January 14 and should result in pilots being more knowledgeable about their aircraft and its limitations. Copies of both are enclosed.

The revised Part 135 provides training in weight and balance, runway limitations for takeoff and landing, aircraft performance data, and operating limitations during initial, transition, and upgrade ground training for pilots. In April 1979, increased Part 135 surveillance requirements were initiated which involved additional en route inspections and other FAA emphasis items. Crewmembers demonstrated their knowledge of weight and balance procedures and aircraft performance as part of the surveillance.

In the transmittal letter of October 17, 1979, the NTSB stated it would be impractical to accomplish flight training in an aircraft loaded to gross weight or at c.g. limits, but that pilots should nevertheless be thoroughly familiar with performance at maximum certificated gross takeoff weight and have training under conditions at or near gross weight, etc.

The revised training and testing requirements and the exposure to various weight and loading conditions that the pilot will receive during the acquisition of operating experience now required in Amendment No. 135, will provide the needed additional familiarization and knowledge of aircraft performance deficiencies. We believe these actions fulfill the intent of Safety Recommendation A-79-80.

A-79-81. Expedite rulemaking which would make the flight time and duty time limitations and rest requirements for commuter air carriers the same as those specified for domestic air carrier crewmembers under 14 CFR 121.

Comment. On August 4, 1980, the FAA issued a supplemental Notice of Proposed Rule Making (NPRM) No. 78-3B, Docket No. 17669, to revise the flight and duty time limitations and rest requirements for flight crewmembers utilized by domestic, flag, and supplemental air carriers, commercial operators, and air taxi operators. I am enclosing a copy of the NPRM for the Board's review and records.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

3 Enclosures

National Transportation Safety Board

Washington, D.C. 20594

Office of Chairman

July 9, 1980

Honorable Langhorne Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to the National Transportation Safety Board Safety Recommendations A-79-80 and A-79-81 issued October 17, 1979. These recommendations, which stemmed from the Safety Board's investigation of several commuter air carrier accidents, pertained to:

1. Pilots' handling of aircraft loaded to maximum gross weight.

2. Flight and duty time limitations for operations under FAR Part 135.

The Federal Aviation Administration's response of January 15, 1980, indicated actions were in progress to resolve these recommendations. To better evaluate their progress and update the public docket, we would appreciate a further report of actions taken.

Sincerely yours,

James B. King

James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of
Chairman

February 7, 1980

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Thank you for your letter of January 15, 1980, responding to the National Transportation Safety Board's Safety Recommendations A-79-80 and 81. Our comments to your response are as follows:

A-79-80. The Safety Board is pleased to note that the Federal Aviation Administration (FAA) is proposing regulatory action to upgrade the operating experience and testing standards of Part 135 pilots. Pending the revision of the rules, A-79-80 is classified in an "OPEN--ACCEPTABLE ACTION" status.

A-79-81. It is also noted that the FAA will shortly issue Notice No. 78-3B to provide identical flight and duty time limitations for Parts 135 and 121 operations. Pending regulatory action, A-79-81 is also being maintained in an "OPEN--ACCEPTABLE ACTION" status.

Sincerely yours,

James B. King
Chairman

W. A. Wesley

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20590

OFFICE OF
THE ADMINISTRATOR

January 15, 1980

Honorable James E. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-79-80 and 81 issued on October 17, 1979. These recommendations are based on the Board's concern that the expansion of 14 CFR 135 operations, and particularly commuter air carrier operations, be accompanied by measures to assure a level of safety comparable with that of the air carriers certificated under 14 CFR 121. These recommendations would deal with certain aspects of pilot training and with crew flight time, duty time, and rest requirements. The following are the Federal Aviation Administration's (FAA) comments and actions in response to these recommendations.

A-79-80. Require that pilots involved in 14 CFR 135 operations be thoroughly trained on the performance capabilities and handling qualities of aircraft when loaded to their maximum certificated gross weight or to the limits of their c.g. envelope, or both.

Comment. The FAA is in the process of amending Part 135 to require operating experience similar to that required in Part 121 for any pilot prior to designation as pilot-in-command on commuter air carrier operations. This operating experience would expose the pilot to various gross weight operations for each make and model aircraft to be flown. This operating experience will be acquired under the supervision of a company check pilot. The estimated completion date for this regulatory action is March 1, 1980.

In addition, we are issuing a directive that will be more specific as to testing standards regarding pilots as stated in Part 135. Although present training and testing requirements cover aircraft performance, this additional directive will cover this area in more detail. Estimated completion date for this directive is February 1, 1980.

A-79-81. Expedite rulemaking which would make the flight time and duty time limitations, and rest requirements for commuter air carriers, the same as those specified for domestic air carrier crewmembers under 14 CFR 121.

Comment. Considerable work has been done on amending the present flight and duty time requirements for both 14 CFR 135 and 14 CFR 121 to provide compatible requirements. The final draft of the Notice of Proposed Rule Making does provide for identical requirements for Parts 135 and 121. The Supplemental Notice of Proposed Rule Making, Notice No. 78-3B, on this subject, should be issued by the end of March 1980.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C.

AOA #: 933
ACTION/INFORMATION: ASF-1
DUE DATES: Acknowledge 10/31 - Reply 12/26
FOR SIGNATURE OF: ack AVS-1 / Reply AOA-1
COORDINATION WITH/THRU:
INFORMATION COPY: AOA-1/ADA-1/AVS-1/AGC-1
APA-1/AFO-1/AWS-1/AAT-1/ATF-1
/ARP-1/AED-1/APE-1

ISSUED: October 17, 1979

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-79-80 and -81

The air taxi industry, particularly the commuter air carrier segment, has enjoyed tremendous growth in recent years. U.S. commuter airlines have gained an average of 10 percent more passengers and 30 percent more freight each year since 1970. Commuter air carrier revenue passenger miles have increased from 750,048,000 in 1975 to 1,145,000,000 in 1978. The FAA has forecast a 116 percent increase in commuter passenger enplanements between fiscal 1978 and 1989. This forecast growth of the air taxi industry has prompted aircraft manufacturers to produce new and larger aircraft.

However, this expansion has been accompanied by a corresponding rise in commuter air carrier accident fatalities. For example, in the first 7 months of 1975 there were 27 commuter air carrier accidents which included 9 fatal accidents and 24 fatalities. During the first 7 months of 1979 there have been 27 commuter air carrier accidents including 10 fatal accidents and 48 fatalities.

In the past 2 years, the National Transportation Safety Board has investigated numerous commuter accidents in which the aircraft was at or above its maximum certificated gross weight or at or beyond its center of gravity (c.g.) envelope, or both 1/. In all of these accidents, pilots were confronted with the two-fold problem of unfavorable weight and balance and mechanical malfunction. Safety Board investigations of

1/ Aircraft Accident Report: Rocky Mountain Airways, DHC-6, Cheyenne, Wyoming, February 27, 1979. (NTSB-AAR-79-10)
Aircraft Accident Report: Columbia Pacific Airlines, Beech 99, Richland, Washington, February 10, 1979. (NTSB-AAR-78-15)
Aircraft Accident Report: Antilles Air Boats, G-21A, St. Thomas, Virgin Islands, April 5, 1978. (NTSB-AAR-79-9)

2613-C

these accidents also revealed that the pilots had received no flight or ground training on the performance capabilities and handling qualities of the aircraft when loaded to its maximum certificated gross weight or at the limits of its c.g. envelope.

On March 1, 1979, a commuter air carrier flight, a Beech Model 70, Excalibur conversion, crashed during takeoff at the Gulfport-Biloxi Regional Airport, Gulfport, Mississippi. The investigation revealed that the aircraft was over its maximum certificated gross weight, and out of its c.g. envelope. It also revealed uncorrected maintenance discrepancies, that the ADF and wing flaps were inoperative, and that the starter interrupt system had been bypassed. Further, it revealed that aircraft dispatch operations were hurried and that, in particular, data for weight and balance computations were carelessly compiled. Moreover, the pilot had received no training on the performance capabilities and handling qualities of the aircraft under high gross weight conditions. The accident illustrates a typical result of poor operational practices and incomplete training. The pilot had flown the aircraft earlier that day at its maximum weight for the first time even though it was on a regularly scheduled, unsupervised passenger flight.

Safety Board investigative experience has disclosed also that air taxi/commuter flights are often conducted at high gross weights. Many of the aircraft used by these operators exhibit flight characteristics and handling qualities at high gross weights that are markedly different from those exhibited at lower gross weight.

While it may be impractical to accomplish flight training in aircraft loaded to the maximum gross weight or at the limits of the c.g. envelope, all pilots should be thoroughly familiar with the performance deficiencies which could be produced by such conditions and have training under conditions approaching these limits. Such performance deficiencies may include an increase in takeoff speed, a longer takeoff roll, a reduction in the rate and angle of climb, and a higher stall speed. These deficiencies may be compounded further by an aircraft malfunction, such as an engine failure. Training regarding these factors would have alerted the pilot in the Gulfport accident to the importance of proper weight and balance for safe flight and he might have required accurate computations to be made.

The Safety Board is aware that the Federal Aviation Administration is currently evaluating comments on NPRM 78-3, "Flight Crewmember Flight and Duty Time Limitations and Rest Requirements," as they apply to 14

CFR 121 operations. However, recent commuter air carrier accidents have given added urgency to the need to revise the crew duty time, flight time, and rest period regulations contained in 14 CFR 135 2/.

The Safety Board believes that the expansion of 14 CFR 135 operations, and particularly commuter air carrier operations, to more closely approximate those of air carriers certificated under 14 CFR 121, should be accompanied by measures to assure a comparable level of safety. Differences in the types of operational activities usually conducted by a commuter air carrier pilot are other factors which support a need for such changes. Commuter air carrier flights are usually short, and during a long-duty day a pilot can be required to make numerous approaches and landings, and numerous instrument approaches -- often conducted as single pilot IFR operations. The commuter air carrier pilot may be required to perform collateral duties such as baggage handling and aircraft refueling. These factors can all contribute to pilot fatigue, with a possible resultant deterioration of basic flying skills and judgment.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require that pilots involved in 14 CFR 135 operations be thoroughly trained on the performance capabilities and handling qualities of aircraft when loaded to their maximum certificated gross weight or to the limits of their c.g. envelope, or both. (Class-II, Priority Action) (A-79-80)

> Expedite rulemaking which would make the flight time and duty time limitations, and rest requirements for commuter air carriers the same as those specified for domestic air carrier crewmembers under 14 CFR 121. (Class-II, Priority Action) (A-79-81)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, BURSLEY, and GOLDMAN, Members, concurred in these recommendations.

James B. King

By: James B. King
Chairman

2/ Aircraft Accident Report: Universal Airways, Beech 70, Gulfport, Mississippi, March 1, 1979. (NTSB-AAR-79-16)
Aircraft Accident Report: Columbia Pacific Airlines, Beech 99, Richland, Washington, February 10, 1978. (NTSB-AAR-78-15)
Air New England, DHC-6, Yarmouthport, Massachusetts, June 17, 1979. (Currently under investigation)

OCT 17

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

April 9, 1979

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is to advise you concerning the status of National Transportation Safety Board Safety Recommendations A-72-178 and 179.

A-72-178. Amend FAR 135.136 to provide for daily, weekly, and monthly flight and duty time limitations.

A-72-179. Amend FAR 135.136 to provide that all flying, including private as well as commercial, shall not exceed the prescribed flight and duty time set forth in this section.

Comment. The following is extracted from the supplementary information provided in Federal Register 46744, October 10, 1978, for amended FAR Part 135:

> "Flight and Duty Time Limitations (Proposed Subpart F). An entire subpart dealing with flight crewmember flight and duty time limitations has been deferred for further consideration while the rulemaking proposed in Notice 78-3 is completed. That notice proposed changes in flight and duty time limitations governing Parts 121 and 123 operators. Since many of the concepts presented in Notice 78-3 are similar to those proposed in Notice 77-17, information received in response to Notice 78-3 will be helpful to the FAA in completing the Part 135 flight and duty time limitations rulemaking action. In view of the deferral, the present regulation is retained."

As stated in our letter of February 7, 1979, regarding Recommendation A-72-55, same subject, further regulatory action will be taken when review of the comments has been completed. This is a top priority project. We will advise you when action on this item has been completed.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

National Transportation Safety Board

Washington D C 20594

Office of the Chairman

May 3, 1979

Honorable Langhorne Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to your letter of April 9, 1979, responding to safety recommendations A-72-178 and A-72-179 issued December 18, 1972. These recommendations stemmed from the National Transportation Safety Board's "Air Taxi Safety Study." Fatigue-causing factors indicated the need to amend Federal Aviation Regulations (FAR) Section 135.136 pertaining to flight and duty time limitations--hence the two recommendations.

We note that the Federal Aviation Administration (FAA) is reviewing responses to Notice 78-3, which proposes changes in flight and duty time limitations under Parts 121 and 123 of the FAR. We also note that the FAA has deferred action on Notice 77-17, which pertains to flight and duty time limitations under Part 135, until such time as responses to Notice 78-3 have been evaluated. Our goal is to provide air taxi passengers and commuter carrier passengers flying under the rules of Part 135 with a level of safety comparable to that of air carrier passengers flying under the rules of Part 121 and Part 123. We, therefore, agree with the FAA's rationale for deferred action; and we appreciate your assurance that this matter is now being given top priority. In view of the foregoing, these recommendations are being maintained in an "Open--Acceptable Action status."

Sincerely yours,

James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

March 14, 1979

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

This is to acknowledge your letter of February 7, 1979, received in further response to Safety Board recommendation A-72-55. We proposed that the Federal Aviation Administration (FAA) revise FAR Part 135 so as to place a flight and duty time limitation on air taxi/commuter carrier crews. We are pleased to note that the FAA has given this project top priority. The status of this recommendation is now classified as "Open - Acceptable Action."

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

February 7, 1979

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to your letter of December 19, 1978, which requests that a greater priority be given to the FAA's flight and duty time regulatory effort for operations conducted under Federal Aviation Regulations Part 135.

A-72-55. The FAA revise FAR 135 to provide adequate flight and duty time limitations.

Comment. There were a large number of comments on Notice of Proposed Rule Making 78-3 (over 5000 pages). These comments are being reviewed with respect to Federal Aviation Regulations Parts 121 and 123 to which they apply, and also with respect to their application to a Part 135 proposal. As soon as the review of the comments is completed, further regulatory action will be taken. This is a top priority project.

Our position with respect to the deferral of flight and duty time limitations (Proposed Subpart F of Part 135), as explained in our letter of October 27, 1978, is that many of the concepts presented in Notice of Proposed Rule Making 78-3 are similar to those proposed in Notice 77-17. The responses to Notice 78-3 will be helpful in completing the Part 135 rulemaking actions.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

Office of the
Chairman

National Transportation Safety Board

Washington, D.C. 20594

19 DEC 1978

Honorable Langhorne Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to your letter of October 27, 1978, concerning the status of safety recommendations A-72-51 and A-72-55.

Recommendation A-72-51

The Safety Board is pleased to note that FAR Section 135.13 has been amended to give the Administrator the authority to deny ATCO certificates to applicants who have a poor safety record. The status of this recommendation is now classified as "Closed - Acceptable Action."

Recommendation A-72-55

The Safety Board regrets the FAA's deferred action. We believe that a requirement for a Flight and Duty Time Limitation is as important for operations under Part 135 as it is for operations under Part 121 and Part 123. We request greater priority be given to resolve this old recommendation which is now placed in a "Open - Unacceptable Action" status.

Sincerely,

James B. King
James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D.C. 20591

OFFICE OF THE ADMINISTRATOR

October 27, 1978

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is to advise you concerning the status of NTSB Safety Recommendations A-72-51 and 55.

A-72-51. Explicit requirements for background investigation of applicants for ATCO certificates and check pilot authorization be incorporated into the Commuter and V/STOL Air Carrier Handbook (8430.1A).

Comment. This supplements our May 25, 1972, response. FAR Section 135.13 was amended, effective December 1, 1978, to give the Administrator the authority to deny a certificate on the basis of previous revocation records of the applicant or certain employed key personnel. We believe that this satisfies the intent of the recommendation and consider the action complete.

A-72-55. The FAA revise FAR 135 to provide adequate flight and duty time limitations.

Comment. The following is extracted from the supplementary information provided in Federal Register 46744, October 10, 1978, for amended FAR Part 135:

> Flight and Duty Time Limitations (Proposed Subpart F). An entire subpart dealing with flight crewmember flight and duty time limitations has been deferred for further consideration while the rulemaking proposed in Notice 78-3 is completed. That notice proposed changes in flight and duty time limitations governing Parts 121 and 123 operators. Since many of the concepts presented in Notice 78-3 are similar to those proposed in Notice 77-17, information received in response to Notice 78-3 will be helpful to the FAA in completing the Part 135 flight and duty time limitations rulemaking action. In view of the deferral, the present regulation is retained.

We will notify you when action on this item has been completed. Copies of the appropriate sections of the Federal Register are enclosed.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

2 Enclosures

26 JUN 1972

Honorable John H. Reed
Chairman, National Transportation Safety Board
Department of Transportation
Washington, D. C. 20591

Dear Mr. Chairman:

We have reviewed the National Transportation Safety Board's report of the Chicago & Southern Airlines Beechcraft 138 accident at the Peoria Illinois Airport on 21 October 1971. The following are our comments:

The statement made in paragraph d(1) on page 12 quotes only an extract of a transmission by the controller which could be misinterpreted to indicate that the controller made a determination and told the pilot "...fly around the airport and keep it in sight." In fact, the controller relayed the information received from an Ozark flight which had attempted a landing 15 or 20 minutes previous. This relaying of the pilot report is considered a good operating practice on the part of the controller. We recommend that the full transmission be quoted in order to place the paragraph in proper prospective.

On page 13 the Board concludes that "more aggressive followup should have been taken b the GADO..." The facts are that an extraordinary amount of surveillance and inspections was conducted on this operation considering its small size (an average of five aircraft and 12 pilots). This high activity was generated in large part by our suspicions of "hidden records" and a company noncompliance disposition. During the period 19 October 1970 thru 24 October 1971 seven base inspections (maintenance and operations), 46 ramp inspections (maintenance and operations), 15 pilot proficiency checks, 30 enroute inspections and observations by FAA inspectors of eight proficiency checks given by company check pilots were conducted. In addition, 21 meetings were held with the company to affect changes in maintenance and operations manuals. A SWAP inspection was conducted on 5-9 April 1971.

This aggressive inspection and surveillance program also generated many enforcement investigations. In fact, during the period 5 June 1970 thru 21 October 1971, 14 violation actions were filed against Chicago & Southern Airlines and its pilots. As of 21 October 1971, seven of the 14 cases had been processed and sanctions imposed.

From the foregoing resume, we believe the FAA General Aviation District Office did take aggressive followup action to insure the company's continued compliance with all FAR's. Therefore, we recommend consideration be given to amending this paragraph to more accurately reflect the actions of the Federal Aviation Administration.

Sincerely,

[illegible]ED BY
[illegible]ER
[illegible]CR

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20590

OFFICE OF
THE ADMINISTRATOR

25 MAY 1972

Honorable John H. Reed
Chairman, National Transportation Safety Board
Department of Transportation
Washington, D. C. 20591

Notation 724B

Dear Mr. Chairman:

This is in response to your safety recommendations A-72-51 through 55 issued 10 May 1972.

The following comments concerning each of these recommendations are submitted:

1. Explicit requirements for background investigation of applicants for ATCO certificates and check pilot authorization be incorporated into the Commuter and V/STOL Air Carrier Handbook (8430.1A).

   COMMENT: We fail to see the relationship of this recommendation to the accident involving Chicago and Southern Airlines, since it has held an air taxi certificate since 17 April 1969. Neither is there anything to indicate that the past record of the pilot-in-command was a contributing factor. Nevertheless, we had -- prior to receipt of your 10 May issuance -- established a regulatory project designed to amend Part 135 to provide for denial of an ATCO certificate in cases where the applicant had a previous history of non-compliance with the Federal Aviation Regulations. If such a rule is adopted, appropriate field instructions will be issued concerning the screening of ATCO applicants.

   Notwithstanding your comment with respect to ATCO check pilots, paragraph 224 of Handbook 8430.1A contains explicit instructions for the designation of check pilots, including provisions for determining their honesty and dependability.

2. A central facility be provided within the FAA where information would be maintained on a company/applicant name cross-reference basis for violations of the regulations and for involvement in accident and incident data.

COMMENT: Centralized storage of information on violation and accident history of pilots, and operators, is presently available at FAA Headquarters and Oklahoma City. However, to provide even better capability for retrieval of such information, the FAA is implementing a fully automated system.

3. The FAA promulgates a provision in FAR Part 135 giving a GADO the authority to refuse an ATCO certificate on the same basis for which one could be suspended or revoked.

COMMENT: Your staff has apparently overlooked the provisions of FAR 135.15 which requires an ATCO applicant to "show to the satisfaction of the Administrator, that he is able to conduct each kind of operation for which he seeks authorization in compliance with applicable regulations." Handbook 8430.1A contains detailed instructions for inspecting ATCO applicants to determine compliance with Part 135. Obviously, if the applicant is unable to comply, the certificate will not be issued. By the same token, if a certificate-holder demonstrates that he is no longer able to comply with Part 135, his certificate is suspended or revoked as appropriate.

4. The FAA requires the use of either actual scaled or passenger declared weights for those aircraft under 12,500 pounds that are employed in commercial or air taxi operations. The use of declared weights should be restricted to those operators receiving specific authority from the FAA.

COMMENT: Chicago and Southern's operations specifications did authorize the use of average passenger weights under most circumstances. This procedure has been used under FAR 135, 121 and predecessor regulations for many years. The authorization to use average weights in no way relieves the carrier of the responsibility for compliance with the performance requirements of 135.148 or the operating limitations of 91.31. We feel these regulations provide adequate control in this particular area, however, we will take another look at this area to determine if additional controls are required.

5. The FAA revise FAR 135 to provide adequate flight and duty time limitations.

<u>COMMENT</u>: Your statement that the present provisions of Section 135.136 permits a pilot to fly as much as 310 hours in a 31-day period would only be true if a 10-hour non-stop flight were scheduled and flown each day without any delays. We believe you will agree that this is totally unrealistic with respect to air taxi operations. For the record, we do have a rule making project under which we will consider bringing the Part 135 flight and duty time limitations more in line with those required under Part 121.

Sincerely

J. H. Shaffer
Administrator

UNITED STATES OF AMERICA
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 10, 1972

Adopted by the NATIONAL TRANSPORTATION SAFETY BOARD
at its office in Washington, D. C.
on the 19th day of April 1972

FORWARDED TO:
Honorable John H. Shaffer
Federal Aviation Administration
Department of Transportation
Washington, D. C. 20591

SAFETY RECOMMENDATIONS A-72-51 thru 55

Investigation of the air taxi accident of Chicago & Southern Airlines, Inc., on October 21, 1971, in the vicinity of Peoria, Illinois, disclosed regulatory areas that require consideration for corrective action.

The National Transportation Safety Board believes the following areas require review by the Federal Aviation Administration:

A. BACKGROUND INVESTIGATION OF APPLICANTS FOR ATCO CERTIFICATES AND CHECK PILOT AUTHORITY

With the expansion of scheduled air taxi operations, and with many of the air carriers having a form of interline agreement with scheduled air taxi operators, the Board believes that there is a need for increasing the requirements for a background investigation of Part 135 operators to improve the overall safety of their operations.

Review of the Federal Aviation Administration Commuter and V/STOL Air Carrier Handbook (8430.1A) did not disclose adequate guidelines for a background investigation of a check pilot applicant or a requirement to consider the background of an applicant for an ATCO certificate. Without specific requirements that such checks be accomplished, the possibility exists that an applicant who has a record of below standard safety performance and who has been cited with numerous FAR violations may be issued an ATCO certificate or be given check pilot authority.

To augment a background query, a central clearinghouse within the FAA is needed where information would be maintained on a company/applicant name cross-reference basis for violations of the regulations and for involvement in accidents and incidents. At the present time, a General Aviation District Office (GADO) or an inspector has no expedient method to collect such data for consideration.

Review of Federal Aviation Regulation Part 135 disclosed that there is no provision giving a GADO authority to refuse to issue an ATCO certificate, on the same basis for which one could be suspended or revoked. The Board believes that such authority is paramount to facilitating adequate safety guidance and control.

The Safety Board recommends that:

1. Explicit requirements for background investigation of applicants for ATCO certificates and check pilot authorization be incorporated into the Commuter and V/STOL Air Carrier Handbook (8430.1A).

2. A central facility be provided within the FAA where information would be maintained on a company/applicant name cross-reference basis for violations of the regulations and for involvement in accident and incident data.

3. The FAA promulgate a provision in FAR Part 135 giving a GADO the authority to refuse an ATCO certificate on the same basis for which one could be suspended or revoked.

B. USE OF AVERAGE PASSENGER WEIGHTS VERSUS ACTUAL OR DECLARED WEIGHTS

In the course of the investigation it was noted that the operator was authorized in his Operations Specifications to use average, assumed or estimated passenger weights in computing the weight and balance of the aircraft. Review of past history reveals that small aircraft are extremely critical to weight-and-balance variances, and that the majority of accidents for which weight and balance was assessed to be in the causal area occur to small aircraft.

The operational difficulties in making advance reservations, or in maintaining an economically feasible schedule if actual scaled passenger weights are made a requirement is recognized. Therefore, the Board recommends that:

4. The Federal Aviation Administration require the use of either actual scaled or passenger declared weights for those aircraft under 12,500 pounds that are employed in commercial or air taxi operations. The use of declared weights should be restricted to those operators receiving specific authority from the FAA.

C. FLIGHT TIME LIMITATIONS

Investigative findings and hearing testimony pertaining to flight time and flight time violations disclosed that FAR Part 135 does not prescribe maximum yearly or monthly flightcrew flight time limitations, nor does it prescribe a 7-day duty time limitation.

Although there is no definitive measure for pilot fatigue or positive method to determine that an accident was fatigue induced, the Board believes that pilot fatigue does cause accidents. Therefore, there is a need for practical flight time limitations, especially for commercial operations. Under the present provisions of FAR 135.136, a pilot can fly as much as 310 hours in a 31-day period. Reference to FAR 121.503 (Flight time limitations pilots airplanes) reflects that it limits pilots of supplemental air carrier and commercial operators, that operate under the provisions of FAR 121, to 100 hours during any 30 consecutive days and 1,000 hours during any calendar year. These limitations were adopted for the primary purpose of preventing fatigue-induced errors by commercial flightcrews of large aircraft. The Board believes that similar limitations should also apply to Part 135 operators. Therefore, the Safety Board recommends that:

5. The Federal Aviation Administration revise FAR 135 to provide adequate flight and duty time limitations.

Our technical staff is available for any further information or clarification if required.

These recommendations will be released to the public on the issue date shown above. No public dissemination of the contents of this document should be made prior to that date.

Reed, Chairman; Laurel, McAdams, Thayer and Burgess, Members, concurred in the above recommendations.

John H. Reed

By: John H. Reed
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 10, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-70

At 1755 eastern standard time, January 31, 1981, a Northwest Airlines, Inc., DC-10-40 departed Dulles International Airport for Seattle, Washington. While climbing through 6,000 feet, the flightcrew heard a loud noise, detected indications of a failure of the No. 3 engine, and felt airframe vibrations. The engine was shut down successfully, and there was no fire. The flight returned to Dulles and made a safe landing without further incident.

On May 15, 1981, as a result of the early metallurgical findings which indicated that the No. 30 fan blade in the No. 3 engine had failed at a point where it had been subjected to an electrical arc burn, the Safety Board adopted Safety Recommendations A-81-63 and -64 to the Federal Aviation Administration addressing the need for caution in conducting maintenance and inspection of titanium fan blades on the Pratt and Whitney JT9D-20 high-bypass turbofan engines. As the investigation continued, problems regarding the structural design of the nose cowl assembly, the fan case, the fan exit case, and their attaching mechanisms became evident.

Examination of the aircraft revealed that the No. 3 engine nose cowl assembly and the fan case had separated from the engine. The No. 30 fan blade had separated from the fan disc about 1 inch above the blade platform as a result of a chordwise fatigue crack and overload fracture, which initiated at the arc burn point. Of the 20 nose cowl-to-engine fan case attachment bolts on A-flange, 13 were missing, 6 had failed in shear, and 1 had pulled out of its nutplate. There were indications that some of the missing bolts had pulled out of their nutplates and that five of the fan case attachment lugs had failed laterally in bearing load.

The Safety Board determined that when the fan blade fractured, it struck the fan case and the inner nose cowl near the 6-o'clock position causing the loss of 2 to 5 A-flange nose cowl retention bolts in the area of the impact. The impact loads may have also caused B-flange bolt fractures and B-flange breakout in an area corresponding to the A-flange failures. The engine dynamic imbalance and the aerodynamic loads on the engine nose cowl loaded the remaining A-flange fasteners beyond their tensile strength and the flange joint began to separate.

3252-B

The bolts sheared in a sequential circumferential (unzipping) manner until only fasteners between the 1- and the 3-o'clock positions remained. Aerodynamic forces then lifted the cowl away from the engine, pivoting about the remaining bolts, stripping the bolts from their nutplates, and bending the flange backward and outboard. The cowl separated upward and outward and struck right wing slat No. 5. As the A-flange fasteners progressively separated, additional aerodynamic loading caused interaction between the fan blade tips and the fan case, and caused increased loading on the B-flange. The torsional loads imposed by fan blade tips striking the fan case and the additional aerodynamic loading caused failure of the B-flange fasteners. The unrestrained fan case moved in and out of the fan exit case and struck the fan exit guide vanes at random locations. The fan case was driven forward and was radially swung away from the engine, striking the fan exit case. The impact caused the fracture of a small section of the fan exit case B-flange and bent it backward and inboard. The fan case departed upward and inward and struck leading edge Nos. 1 and 2 slats on the right wing. The nose cowl and fan case from the No. 3 engine came to rest in a populated area.

Postincident examination also revealed that the Nos. 1, 2, and 5 leading edge slats on the right wing, and the No. 2 engine, had been damaged by foreign objects from No. 3 engine components and debris. Visual inspection of the No. 2 engine fan rotor revealed that 32 of the 46 fan blades had received such damage, which ranged from 0.030-inch nicks to 2- to 3-inch sections missing from the blades' leading edges at blade station 23.5, just below the outboard shroud. Six damaged blades from the No. 2 engine were examined metallurgically in an attempt to determine the composition of the material that the No. 2 engine had ingested. A test sample of material deposited on the No. 25 blade contained significantly higher quantities of iron than the titanium alloy of the fan blades. The fan case and fan exit case are made of stainless steel, which contains iron; consequently, fragments from these two components of the No. 3 engine probably damaged the No. 2 engine. With regard to the JT9D engine and its installation on DC-10 aircraft, the engine manufacturer is responsible for compliance with 14 CFR 33 and the aircraft manufacturer is responsible for compliance with 14 CFR 25. The nose cowl and fasteners for attachment to the JT9D engine are provided by the aircraft manufacturer but the cowl is fastened to the A-flange of the engine fan case which is provided by the engine manufacturer. It appears in this incident that the broken fan blade damaged the A-flange and fasteners (and probably the B-flange and fasteners) which allowed the nose cowl and fan case to separate from the engine in response to dynamic imbalance loads, aerodynamic loads, and fan-fan case interaction loads. We conclude that the failure of a single blade resulted in the loss of major engine components, foreign object damage to the No. 2 engine, and structural damage to leading edge devices. Although we recognize that this was the only failure of this type of engine installation, the Safety Board is concerned that these regulations as they existed for certification may not have been met with regard to the JT9D engine and its installation on the DC-10 aircraft.

The No. 30 fan blade from the No. 3 engine, serial No. BU9913, had accumulated 14,864 flight-hours and 9,699 cycles. It had been last inspected on December 9, 1980, and no discrepancies were noted. Since that time, the engine had been operated 306 hours and had accumulated 134 cycles. The blade had been reworked by TRW Components Division of TRW, Inc., Cleveland, Ohio, in November and December 1979. At that time, the following were accomplished: (1) Service Bulletin No. 4060, glass bead peening; (2) routine blending and overhaul; (3) hardface strip/removal; (4) rehardfacing; and (5) fluorescent dye penetrant inspection. As part of the incident investigation, the Safety Board observed both fan blade rework and overhaul processing procedures at the facilities of TRW, Inc., in Cleveland, and at Northwest Airlines' facilities in Minneapolis, Minnesota. No discrepancies in rework and processing procedures were identified.

Fourteen JT9D fan blade failures have been reported to the manufacturer since the engine went into service. Six failures have occurred on JT9D engines installed on DC-10 aircraft, and eight failures have occurred on JT9D engines installed on Boeing 747 aircraft. Damage to the 13 previous aircraft involved has varied from minor internal engine damage to engine nose cowl or fan case penetration to thrust reverser separation.

In the incident investigated, the Safety Board believes that the safe operation of the aircraft was jeopardized by the damage to the No. 2 engine and the leading edge devices, which resulted from the failure to contain the damage to the No. 3 engine. Therefore, the Safety Board recommends that the Federal Aviation Administration:

> Review the design of the flanges and fasteners on the forward and aft faces of the fan case of the JT9D turbofan engine to insure that the intent of airworthiness requirements provided in 14 CFR 33 and 14 CFR 25 are satisfied. (Class II, Priority Action) (A-81-70)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 10, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-71 and -72

On June 27, 1981, an Aerospatiale AS350 helicopter, N1381BH, experienced a severe tail rotor vibration while in flight. The pilot was able to execute a successful emergency landing. The tail rotor vibrated because a tail rotor pitch change horn, PN350A12-1368-01, had failed as a result of fatigue cracking where it attaches to the blade root. Total operating time on the failed part was 950 hours.

In recent months, there have been four similar fatigue failures of the tail rotor pitch change horn, one in Canada and three in the United States. Operating times ranged from 450 to 1,800 hours. The pitch change horn presently has no prescribed life limit. The most recent failure occurred despite the operator's compliance with Federal Aviation Administration Emergency Airworthiness Directive 81-13-09 dated June 16, 1981, which made Aerospatiale Telegraphic Service Bulletin 01.07A mandatory for all Aerospatiale AS350 model helicopters (173 AS350 helicopters are registered in the United States). The AD required the following inspection criteria:

> Within 10 flight-hours, remove the pitch change horns from the two tail rotor blades, thoroughly clean the mounting bolt areas of the horn flange, conduct a fluorescent dye penetrant inspection of the horns for evidence of cracks, thoroughly clean the mating surfaces of the horn and the blade root flange, and check for flatness of the mating surfaces by performing a trial installation. Once reassembled, conduct a daily preflight visual inspection of the pitch horns using a 5 power magnifying glass in the area of the mounting bolt countersink and adjacent radii of the yoke.

Although the pitch change horn on the accident aircraft had been inspected in accordance with the Airworthiness Directive, the existing fatigue area had apparently missed detection. The Board noted when examining the failed part that the horn surface had been cleaned but residue remained in the area of the fatigue cracks.

The manufacturer has indicated to the Safety Board that a 400-hour service life for the PN350A12-1368-01 tail rotor pitch change horn is being considered. The Safety Board believes that this proposed action should be reviewed expeditiously to determine a proper life limit on the tail rotor pitch change horn.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Take immediate action to revise the existing inspection instructions of AD-81-13-09 to stress the importance of thoroughly cleaning the pitch change horn in the area of the mounting bolt countersinks and adjacent yoke radii before performing the dye penetrant and visual inspections required. (Class I, Urgent Action) (A-81-71)
>
> Expedite review of the recent failure history and existing flight-load data on the AS350, PN350A-12-1368-01, tail rotor pitch change horn and issue an Emergency Airworthiness Directive to establish a life limit for the part. (Class I, Urgent Action) (A-81-72)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

James B. King

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 21, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-73

On January 16, 1981, the National Transportation Safety Board investigated an aircraft accident in Pittsburgh, Pennsylvania, involving an Italian Agusta 109A helicopter. The investigation disclosed that the No. 7 tailrotor driveshaft bearing had failed, which resulted in the failure of the tubular tailrotor shaft tubing. The exact reason for the failure of the bearing could not be determined; however, there was no lubrication on the bearing parts. This is the first known failure of the bearing and driveshaft assembly.

There are no overhaul or replacement time limits on either the driveshaft or its seven bearings; however, they are required to be inspected visually during preflight. The No. 7 bearing and its support are located in the base of the vertical stabilizer assembly and previously could only be inspected by removing a piece of skin. The inaccessibility of the bearing and its support could have been a factor in whether or not an adequate daily preflight inspection was performed. Access to six bearings for inspection involves removing the hinged tailcone cover. Since the accident, all similar aircraft in this country have had an inspection door installed in order to perform inspections of the No. 7 bearing more easily. All aircraft coming off the assembly line now have an inspection door installed.

While the bearing accessibility problem has been solved, the maintenance manual, Chapter 65-30-17, page 204, does not describe clearly the manner of inspecting and maintaining the bearings. It does not require the removal of the bearing covers to examine the internal areas of the bearings for lubrication and general condition. The manual does not require inspection of the overall condition of the rubber collars which clamp the bearing's inner race to the tailrotor driveshaft. Although required by the maintenance manual, there were no slippage marks on the No. 7 bearing, on the other six driveshaft bearings, or on the tailrotor driveshaft. Also, the lubrication requirements stated in the maintenance manual do not specify a lubricant nor lubrication intervals for the tailrotor driveshaft bearings. The failure to specify lubrication intervals and an approved lubricant may have contributed to the lack of lubrication in this case.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Revise the Agusta 109A helicopter maintenance manual to specify a more detailed daily inspection requirement, a maintenance service interval for lubrication, and an approved lubricant to be used on tailrotor driveshaft bearings. (Class II, Priority Action) (A-81-73)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 28, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-74

On January 20, 1981, Cascade Airways, Inc., Flight 201, a Beech 99A, crashed about 4.5 miles southwest of Spokane International Airport, Spokane, Washington. The flight was operating as a scheduled commuter under 14 CFR Part 135.

The National Transportation Safety Board's investigation of the accident revealed that Flight 201, operating on an instrument flight rules (IFR) flight plan in instrument meteorological conditions, was initially vectored for an instrument landing system (ILS) approach to runway 21 after contacting Spokane approach control. When the active runway was later changed to runway 3, Flight 201 was vectored to the final approach course even though activation of the localizer for runway 3 was held up to allow another aircraft to complete its ILS approach and landing on runway 21. When the localizer for runway 3 was activated, Flight 201 was advised promptly and given the aircraft's position as 6 miles from the OLAKE intersection.

Based on an analysis of the investigative evidence and the operation and display of the distance measuring equipment (DME) mode selector installed in the accident aircraft, the Safety Board concluded that the crew probably used the DME from the Spokane VORTAC (located 4.2 miles from the end of the runway) rather than the DME associated with the localizer (located at the end of the runway).

Cascade 201 was equipped with a DME-select switch which had four positions labeled "DME 1", "DME hold", "DME 2", and "RNAV." This feature allows the pilot to do the following: with the "DME 1" button depressed, the DME is automatically tuned to the same frequency as the No. 1 navigation radio. If the pilot then pushes the "DME hold" button and retunes the No. 1 navigation radio, the DME remains on the frequency previously selected on the No. 1 navigation radio. As a result, the DME mileage is generated from a frequency which is not displayed anywhere in the cockpit. The pilot must remember the navigation aid from which the distance information is derived. The Safety Board believes that the captain of Cascade 201 probably used the airborne DME equipment in the manner just described and forgot that the DME equipment was actually tuned to the DME associated with the Spokane VORTAC when the localizer was activated by the tower. The Safety Board believes that a direct readout of the actual frequency being used for navigation should be visually available to the flightcrew at all times.

3179E

Although an amber light is activated on the DME mode selector when the "DME hold" function is in use, the light may be overlooked by the pilot in certain situations. While the "DME hold" feature provides the pilot with more flexibility by allowing him to preselect navigation frequencies, this advantage may be offset by the need to remember the source of the DME mileage display during periods of increased cockpit workload.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require in future radio navigation instrument installations, that all frequencies being received through navigational receivers that are providing essential navigational information (directional guidance or distance) be displayed so that the source of the navigational signal can be readily discerned by the pilot. (Class II, Priority Action) (A-81-74)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

James B. King

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 28, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-75 through -76

About 11:27 p.s.t., on January 20, 1981, Cascade Airways Flight 201, a Beech 99 operating from Moses Lake to Spokane, Washington, crashed about 4.5 miles southwest of Spokane International Airport. The aircraft crashed while the pilot was making a localizer approach to runway 3. Seven people were killed, including the flightcrew, and two passengers were injured seriously.

Flight 201 was operating under 14 CFR Part 135.99; under this regulation two pilots were required and the company's flight manual required specific crew coordination procedures. However, neither the regulations nor company procedures required interphone communication in the operation, and none was provided between the captain and first officer on Flight 201.

After the accident, the Safety Board took noise measurements in the cockpit of a Cascade Beech 99 to the right of the captain's head. Measurements were taken in flight at 95 percent rpm with 1,100 ft/lbs of torque; the noise level was 97 dB(A). 1/ These measurements agree in general spectral shape and level with Beech 99 cockpit noise measurements taken by the Beech Aircraft Corporation. The speech interference level between the captain and the first officer was calculated at 85.5 dB(A). Speech interference values indicate the sound pressure at which the speech signal must be at the listener's ear for a given noise condition in order to be heard reliably. Noise experts agree that in this particular noise environment, face-to-face communication is difficult and falls in the voice range between shouting

1/ The human ear is not equally sensitive at all frequencies. Therefore, for measurement purposes, a weighting scale is used to alter the sensitivity of the sound level meter with respect to frequency so that the instrument is less sensitive at frequencies where the ear is less sensitive. The A-weighting scale, dB(A), is the most widely used in noise control.

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and maximum vocal effort. 2/ Furthermore, noise data submitted to the Safety Board by the Beech Aircraft Corporation indicated that the Beech 99 cockpit noise level during approach is 94.1 dB(A). This value, although lower than that in flight, still yields a noise level in which face-to-face verbal communication is difficult and requires a vocal effort of shouting or greater. Therefore, both in flight and during approach, the Beech 99 aircraft cockpit noise levels preclude effective verbal communication.

Further evidence of communication difficulty was provided by the captain of Flight 201 himself who had previously told his colleagues that he did not talk very much in the cockpit because he believed the Beech 99 cockpit noise levels precluded normal speech. Therefore, when the crew of Flight 201 may have been attempting to detect and correct an operational/navigational problem and unhampered crew coordination was essential, the cockpit noise levels could have interfered with verbal communication.

The cockpit noise level in the DeHavilland DHC-6 was cited by the Board in its report NTSB-AAR--80-1, in which the first officer was quoted with respect to the difficulties experienced with intra-cockpit communication without the use of headsets and interphone. These same views were expressed by other DHC-6 pilots. In its analysis, the Safety Board specifically stated that the first officer's performance in the accident should be considered in light of a number of factors including the noisy cockpit. Although not directly related to ambient cockpit noise, the Safety Board measured the loudness of the ground proximity warning system (GPWS) in its investigation of the National Airlines Boeing 727 in Pensacola, Florida, on May 8, 1978. It determined that the loudness of this system had impeded verbal intra-cockpit communication.

A recent National Aeronautics and Space Administration (NASA) study found that flightcrews who communicated less frequently in the cockpit were apt to make more performance errors than crews who communicated more often. 3/ It may be true that in normal operations flightcrews develop and use hand or body signals as a means of communication so that verbal communication is not necessary. However, a crisis or emergency situation demands unambiguous information and efficient transfer of information between the pilots. The Safety Board believes that the noise levels measured in the Beech 99 aircraft preclude efficient, unambiguous verbal communication.

The Safety Board is concerned that cockpit noise levels are loud enough to interfere with verbal communication between flight crewmembers. Currently, there are no certification standards for maximum allowable cockpit noise levels for face-to-face verbal communication.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Establish for aircraft used in commercial operation the maximum cockpit noise levels which will permit adequate direct voice communication between flight crewmembers under all operating conditions. (Class II, Priority Action) (A-81-75)

2/ There are established relationships for face-to-face speech communication in noise environments. Noise experts are in general agreement as to the communication difficulties in various noise environments at various speaker-listener distances.

3/ Foushee, H.C. (NASA-AMES Research Center) and Manos, K.L. (U.S. Air Force Academy), Cockpit communication patterns and the performance of flightcrews. FORUM- The International Society of Air Safety Investigators. Spring, 1981, pg., 19-20.

Require the installation and use of crew interphone systems in the cockpits of those aircraft in which noise levels reach or exceed the maximum level established for adequate direct voice communication between flight crewmembers under all operating conditions. (Class II, Priority Action) (A-81-76)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

James B. King

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 28, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-77 through -79

On March 25, 1981, a Houston Helicopters Bell 206, N1077H, experienced an engine failure at 500 feet m.s.l. during cruise flight over Brazos Block 578 in the Gulf of Mexico. The pilot entered autorotation and attempted to deploy the emergency floats by triggering the emergency float inflation switch. The floats failed to deploy and the aircraft struck the water gently, rolled over, and floated inverted. The pilot and five passengers aboard escaped without injury.

Investigation disclosed that the emergency flotation pneumatic system valve failed to actuate and inflate the float bags. The valve assembly consists of an integral piston pin, shear head, and an electrically fired squib charge. When the squib is fired, the piston pin releases the shear head and nitrogen gas inflates the float bags. Examination of the Futurecraft Corporation valve assembly revealed that although the squib charge had fired, the shear head release piston pin was incorrectly installed and was wedged in the machined groove of the shear head. The binding of the piston pin in the machined groove prevented release of the shear head and nitrogen gas to inflate the float bags. The manufacturer of the squib valve has reported 12 cases of improperly installed shear head release piston pins.

As a direct result of this accident, Bell Helicopter issued Alert Safety Bulletin No. 206L-81-21, dated May 7, 1981. This bulletin describes methods of inspecting the piston pin for correct installation in relation to the shear head.

Because of the serious consequences of this failure and the potential for similar failures, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Airworthiness Directive making the provisions of Bell Helicopter Alert Service Bulletin No. 206L-81-21 mandatory for all 206L Series Aircraft. (Class II, Priority Action) (A-81-77)

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SUMMARY OF FEDERAL AVIATION ADMINISTRATION RESPONSES TO NATIONA--ETC(U)
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Assess the need to modify the Futurecraft Corporation valve shear head release piston pin to minimize the possibility of installing the piston pin incorrectly. (Class II, Priority Action) (A-81-78)

Determine whether other models of helicopter aircraft equipped with emergency flotation equipment use the same Futurecraft Corporation valve and take appropriate corrective action to advise the operators of those aircraft of the potential problem. (Class II, Priority Action) (A-81-79)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

James B. King

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 3, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-80 and 81

At 8:41 p.m., on April 23, 1980, a Mitsubishi MU-2 aircraft, N307MA, crashed about 1/2 mile north of Sky Harbor Airport, Henderson, Nevada. The aircraft was a night visual flight rules (VFR) arrival, and the pilot had intended to land at McCarran International Airport, Las Vegas, Nevada.

At 8:38 p.m., the pilot declared an emergency low-fuel status, McCarran Approach Control acknowledged the emergency and then advised the pilot that McCarran International Airport was 12 o'clock and that Sky Harbor Airport was at 10 o'clock. The controller then asked, "Are you going to try for McCarran or do you want to go to Sky Harbor? It's about 5, 6 miles to McCarran, 4 miles to Sky Harbor." The pilot replied that he was "heading for Sky Harbor at this point." The pilot later reported, "I don't see the airport, sir." The controller then asked another aircraft, N35211, that had been in the vicinity of Sky Harbor Airport, "Were the lights out at Sky Harbor when you went over there?" N35211 replied, ". . . negative lights at Sky Harbor." The controller then said, "OK we're going to call now to get them on. . . ." The controller then asked N35211 aircraft ". . . change to unicom, click your mike twice and see if that'll get the lights on there at Sky Harbor." Shortly thereafter, N35211 reported that the Mitsubishi just crashed and that there was a "big explosion upon impact." Witnesses later reported that the aircraft "started to climb, snapped over, and went into a spin."

Investigation of the accident revealed that the Sky Harbor Airport is an unlighted airport (there were no lights available to be turned on), there was sufficient fuel (about 17 gallons at the time of impact) to fly to McCarran International Airport, and the aircraft had no mechanical malfunctions. The Safety Board concluded that the pilot diverted his attention from the operation of his aircraft while searching for the unlighted airport.

The Safety Board is aware of the existence of an ATC software modification which would have insured that the controller relayed correct information to the pilot. Houston International Airport is currently using the Airport Data, Point to Point Range and Bearing Slew Entry (an Automated Radar Terminal System--ARTS III program patch) to provide a controller with complete airport information, such as runways, elevation, lighting, and range and bearing from an aircraft's position to the airport. This information is presented on the controller's radar display. Any ARTS facility has the capability of utilizing this feature, which was developed by the Federal Aviation Administration's (FAA) Data Systems Staff at the Houston International Airport. The Safety Board believes that the emergency airport data is a valuable safety feature and that the accident at the Sky Harbor Airport, as well as others that the Safety Board has investigated, could have been prevented had such data been immediately available to the controller. The Safety Board does not believe that this feature should be a substitute for local area knowledge required of the controller but should be considered to be a type of reinforcement much like the checklist in an aircraft. The Safety Board also believes that the same type of emergency airport data should be made available to the en route controller when the next Air Route Traffic Control Center (ARTCC) computer equipment is implemented.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require that all terminal facilities utilizing Automated Radar Terminal Systems (ARTS automation) incorporate an emergency airport information feature, such as that currently used at the Houston International Airport. (Class II, Priority Action) (A-81-80)
>
> Incorporate the features required to enable en route controllers to display emergency airport information, such as that currently displayed at the Houston International Airport, in future en route air traffic control computer systems. (Class II, Priority Action) (A-81-81)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 3, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-81-82

On August 2, 1980, a Hughes 500C helicopter was on a nonscheduled air taxi flight near Kivalina, Alaska. The pilot started a descent from 3,000 feet toward a landing site, during which the power turbine speed (N_2 rpm) climbed from the normal indication of 103 percent to 120 percent, resulting in an overspeed. When the pilot was not able to reduce electrically the excessive turbine speed, he increased the collective to increase torque and attempted to manually control the governor. When this action was also ineffective in reducing the power turbine speed, the pilot elected to enter an autorotation. During touchdown on rolling terrain, the helicopter's main rotor blades flexed downward and severed the tailboom. The pilot, the sole occupant, escaped injury.

The governor, fuel control, fuel pump, and high pressure filter were removed from the Allison 250-C20 turbo-shaft engine and forwarded to a certificated repair station where they were evaluated. The Chandler Evans governor, which had a total time since overhaul of 1,108.9 hours, was disassembled. Metal contamination, consisting of metal filings from the high pressure fuel filter bypass valve seat, were found around the diaphragms in the governor, and score marks were found on the speed weight metering lands. The score marks and the metal contamination indicated that the governor speed weight had seized during operation. Examination of the high pressure filter bypass valve seat showed chatter marks which indicated that the high pressure fuel filter bypass valve had been oscillating and had generated the metal filings. As a result of its evaluation, the Safety Board concluded that the power turbine overspeed resulted from metal contamination, which caused the speed weight to seize.

A review of FAA Service Difficulty Reports on the Chandler Evans governor contained 22 reports of overspeed, 7 of which indicated that the governor had been contaminated. On November 14, 1979, the Detroit Diesel Allison Company issued Commercial Engine Service Bulletin CEB-1144, warning that the high pressure fuel filter bypass valve is subject to wear and should be replaced with kit P/N 6896726; the kit includes a replacement filter element for improved service life. The operator of the accident aircraft had not complied with this service bulletin.

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The Safety Board believes that if Service Bulletin CEB-1144 was made mandatory, the occurrence of power turbine overspeed caused by governor malfunctions would be substantially reduced.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Airworthiness Directive to require compliance with the Detroit Diesel Allison Commercial Engine Service Bulletin CEB-1144. (Class II, Priority Action) (A-81-82)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS and GOLDMAN, Members, concurred in this recommendation. BURSLEY, Member, did not participate.

James B. King

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 3, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-83 and -84

On June 23, 1980, a Beechcraft Model B19, N60BW, crashed shortly after takeoff from Kinston Jet Port, Kinston, North Carolina. The pilot, who received minor injuries, stated that he was not able to maintain lateral control.

The investigation revealed that the left aileron push-pull rod end, which is connected to the aileron bellcrank inside the wing, had failed. The left aileron push-pull rod was examined by an independent engineering testing company, which reported that: (1) the push-pull rod failure was caused by fatigue in reverse bending, (2) the reverse bending force was apparently transmitted from a seized bearing connection to the minimum cross-section of the rod at the root of the machined threads, and (3) the bearing connection at the failed end of the rod was seized because of inadequate bearing lubrication and the subsequent formation of corrosion products which prevented rotational and lateral movement in the bearing connection.

The aircraft records indicated that the last annual inspection was completed on August 20, 1979, 130 tachometer hours before the accident. However, the Safety Board could not determine whether the rod end bearings were lubricated during the inspection. The Beechcraft lubrication diagram in the maintenance manual recommends that the ends of the aileron push-pull rod be lubricated at every 100-hour inspection.

On July 8, 1975, Beechcraft issued a Safety Communique to all owners of Beechcraft Models B19, 23, 24, and 24R series aircraft. The communique indicated that some flight control system pivots and moving parts subject to wear may not have been lubricated adequately, and urged that the flight controls be checked for freedom of movement during each walk-around inspection and before each flight. It further recommended that the controls be serviced and lubricated at proper intervals to insure proper functioning of the flight controls.

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In August 1975, Beechcraft issued Class II Service Instruction No. 0760-010, which pertained to specific Beechcraft Models B19, 23, 24, and 24R series aircraft. Service Instruction No. 0760-010 recommended, during normal maintenance, a general inspection or replacement, or both, of rod end bearings used on engine controls, landing gear retraction systems, nose landing gear steering mechanisms, and flap, aileron, elevator, rudder, and tab controls. The purpose of the service instruction, in part, was to advise all owners that, on occasion, some rod end bearings manufactured by Nippon Miniature Bearing Corporation had seized in service and that, at the owner's discretion, the rod end bearings should be replaced by corresponding parts manufactured by other vendors.

In August 1976, Beechcraft issued Class II Service Instruction No. 0858-151, which pertained to specific Beechcraft Models B19, 23, 24, and 24R series aircraft. The purpose of Service Instruction No. 0858-151 was to insure freedom of movement and proper functioning of all flight control rod ends and pivotal points In part, the service instruction referred specifically to the aileron push-pull rod ends, indicated that restricted movement of the rod end indicates corrosion in the rod end, and further stated that if corrosion is noted both existing forward and aft rod ends should be replaced with new rod ends (P/N 169-380082-3).

The Safety Board could not determine if the aileron rod ends on N60BW were inspected in accordance with the Beechcraft Class II service instructions. However, examination of the failed forward aileron push-pull rod end indicated that the failed rod end (PN HM-4U-M) was manufactured by Heim Company. The aft push-pull rod end (PN HM-4, NMB) which did not fail was manufactured by Nippon Miniature Bearing Corporation. However, this push-pull rod end bearing did not rotate freely in all directions. Based on the identification of the failed push-pull rod end, the forward rod end was installed in accordance with Beechcraft Class II Service Instruction No. 0760-010, but the aft rod end was not replaced as recommended in that service instruction.

The Safety Board's aircraft accident data indicate that between 1964 and 1979 six accidents have involved Beechcraft Models B19, 23, and 24R aircraft in which lateral control was found to be a cause or factor. These accidents resulted in five fatal injuries, two serious injuries, and minor or no injuries to five persons. One accident resulted from frozen rod end bearings and another resulted from a failed rod end. The remaining four accidents resulted from improper installation of the aileron after maintenance.

A review of the Federal Aviation Administration's Service Difficulty Records from January 1976 through January 8, 1981, revealed 15 occurrences of problems with aileron push-pull rod end bearings on Beechcraft Models B19, 23, 24, and 24R series aircraft. Fourteen were related to seized or broken rod ends. Based on the continuing reports of similar failures, the FAA published this information in its General Aviation Alert, Advisory Circular 43-16, dated October 1980.

On earlier models of Beechcraft B19, 23, 24, and 24R series aircraft, such as N60BW, the forward aileron push-pull rod end bearings, aileron bellcrank pivotal point, and cable attachments are relatively inaccessible for routine inspections and maintenance because panels were not installed in the wings for inspection purposes. The ailerons and guard strap from the closure strip must be removed to perform an inspection or routine maintenance. To improve access to those push-pull rod ends, an aircraft and powerplants mechanic employed by a Kinston facility, on his own initiative, installed inspection access panels using approved inspection plates and doublers on a similar aircraft. The mechanic was later nominated for a General Aviation Mechanics Safety Award.

Since 1977, Beechcraft has incorporated aileron access panels in the wings on its Models B19, 23, and 24 series aircraft. The wing access panels provide an opening through which mechanics can inspect and service the forward aileron push-pull rod end bearings without removing the ailerons--thus reducing the man-hours required for inspection and maintenance and eliminating the need to remove the ailerons. The Safety Board believes that the installation of these panels in aircraft manufactured before 1977 would improve the maintainability of these aircraft by making it easier for mechanics to inspect and lubricate the rod end fittings without having to remove the ailerons. This would also reduce the possibility of an improper installation of the aileron by reducing the number of times they must be removed and reinstalled.

In view of the continuing reports on this problem and the hazards associated with a loss of aileron control, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require that the actions outlined in Beechcraft Class II Service Instruction No. 0858-151 as revised be completed on the affected aircraft at the next 100-hour or annual inspection. (Class II, Priority Action) (A-81-83)
>
> Require installation of access plates on all Beechcraft Models B19, 23, 24, and 24R series aircraft manufactured before 1977 to provide access to the aileron push-pull rods, bellcrank, and cable attachments for inspection or servicing. (Class II, Priority Action) (A-81-84)

KING, Chairman, DRIVER, Vice Chairman, McADAMS and GOLDMAN, Members, concurred in these recommendations. BURSLEY, Member, did not participate.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 7, 1981

Forwarded to: Honorable J. Lynn Helms Administrator Federal Aviation Administration Washington, D.C. 20594	SAFETY RECOMMENDATION(S) A-81-85 through -87

On July 31, 1981, a Varga Model 2150A, N8423J, crashed near Bay Bridge Industrial Airport, Stevensville, Maryland, after control of the elevator was lost because of failure of the elevator horn assembly (P/N VAC 6000K-26). Both persons aboard the aircraft were killed.

Metallurgical examination of the elevator horn assembly revealed that the failure was a result of fatigue cracking in the mounting flanges of the horn. The fatigue initiated from multiple origins in the flange radius and propagated through approximately 75 percent of the right flange and 90 percent of the left flange before final separation. Although small portions of the fracture contained characteristics typical of high cycle, low stress fatigue cracking, most of the fatigue appeared to have propagated under relatively high loads. This indicates that the elevator horn assembly could have failed a short time after crack initiation.

Two smaller, secondary fatigue cracks were found in the top of the elevator horn assembly near the mounting flanges. These cracks initiated from near the aft edge of the horn where the channel is wrapped around the shim. The longer of these cracks extended approximately 3/8 inch forward from its initiation area.

Removal of the paint layers from the flange area of the failed horn revealed multiple scratches in the metal. The alignment of these scratches indicates that the fatigue origin area had been sanded or perhaps filed.

A metallurgical examination was also conducted on five additional elevator horn assemblies from the following Varga model 2150A aircraft: N4638V, N4642V, N4617V, N4614V, and N4630V. Paint cracking in the flange radius areas was found on all of these horns except the horn from N4617V which was not painted. In addition, the horns from N4630V and N4642V contained fatigue cracks similar to the secondary fatigue cracks found on the accident aircraft horn.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an emergency Airworthiness Directive to require that all P/N VAC 6000K-26 elevator horn assemblies installed on Varga aircraft be inspected before further flight and thereafter at appropriate time intervals. Horn assemblies should be removed from the aircraft and the mounting flange areas stripped of paint. The upper aft corners of the channel bends and the mounting radii should then be inspected by an appropriate nondestructive test method. Horn assemblies found cracked should be removed from service. (Class I, Urgent Action) (A-81-85)

> Issue an Airworthiness Directive to require that the flange area on all P/N VAC 6000K-26 elevator horn assemblies installed on Varga aircraft be visually inspected before each flight for cracking in the upper aft corners of the channel bends and in the mounting flange radius areas. Horn assemblies found cracked should be removed from service. (Class I, Urgent Action) (A-81-86)

> Evaluate the design of the P/N VAC 6000K-26 elevator horn assembly and the manner in which it is attached to the elevator. (Class II, Priority Action) (A-81-87)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS and BURSLEY, Members, concurred in these recommendations. GOLDMAN, Member, did not participate.

For By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 26, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-88 through 91

On December 7, 1980, a Beechcraft E-90, N2181L, crashed near Michigan City, Indiana. There were no survivors, however, there is evidence that some or all of the four occupants survived the initial crash. Had the aircraft's last known position been correctly and expeditiously communicated to the proper authorities a rescue might have been effected. When South Bend, Indiana, approach control lost radar and radio communications with N2181L, a facility supervisor alerted the Indiana State Police to the possibility of a missing aircraft, rather than calling the Chicago Air Route Traffic Control Center (ARTCC) as he was required to do by Federal Aviation Administration (FAA) Handbook 7110.65B, dated January 1, 1980. 1/

About 3 hours after radar and radio communications were lost with N2181L, Chicago ARTCC was advised of the missing aircraft by the U.S. Air Force Search and Rescue Center at Scott Air Force Base, Illinois. The Chicago ARTCC contacted South Bend approach control to confirm that the aircraft was missing. Consequently, the Chicago ARTCC, which is responsible for issuing an alert notice for missing or overdue aircraft, was more than 3 hours late issuing an alert notice.

About 45 minutes after N2181L was lost on radar, the Indiana State Police alerted the Michigan City Coast Guard facility. The U.S. Coast Guard (USCG) mission coordinator called South Bend approach control to determine the search location. The USCG mission coordinator was advised that the aircraft's last position was 3 to 5 miles west of the intersection of the 233° radial of the Keeler VOR and the 271° radial of the South Bend VOR. The USCG mission coordinator was trained to plot latitudes and longitudes, and he did not have the aeronautical charts possessed by his FAA contact. The USCG search for the missing aircraft began in the wrong location because FAA tower personnel did not follow established notification procedures. However, based on the USCG mission coordinator's estimate of the accident site, the search area was moved to a new location, which was also too far west.

1/ For more information read, "Special Investigation Report: Search and Rescue Procedures and Arming of Emergency Locator Transmitter, Aircraft Accident Near Michigan City, Indiana, December 7, 1980." (NTSB-SIR-81-2.)

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About 3 1/2 hours after loss of radar contact with N2181L, a policeman observed lights flashing off the beach near Michigana Shores. Based on this information, the search area was moved to still another site where floating fuel was found on the surface of Lake Michigan -- 4 hours after radar and radio communication with N2181L was lost. No survivors were found.

The emergency locator transmitter (ELT) installed aboard N2181L did not activate when the aircraft hit the water, and consequently, no electronic signals were generated to guide rescuers to the crash site. Examination of the wreckage revealed that the ELT transmitter function switch was in the OFF position so the ELT could not be automatically activated under any circumstances. Because the ELT unit was recessed in the fuselage of N2181L and was inaccessible to the pilot, a remote switch had been installed on the right side of the fuselage. The remote switch could be used for test purposes to turn the ELT on regardless of the position of the transmitter function switch on the unit itself. This could have led the pilot to believe that the ELT was functioning properly when, in fact, the ELT was not activated. Because of this potential problem the manufacturer, Collins General Aviation Division, has drafted a Service Information Letter and updated the ELT owner's manual, Document 950012, to address this issue. Additionally, Beech Aircraft Company has provided a modification kit No. 101-3062-1 for all Beech aircraft with the CIR-11-2 ELT. When the kit is installed, a bracket will not allow the remote switching plugs to be inserted into the unit unless the ELT transmitter function switch is in the ARM position.

As a result of its special investigation of this accident, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Take steps to make search and rescue operations less vulnerable to human error either by changes in terminal air traffic control accident notification procedures, or by changes in training, supervision, or performance monitoring. (Class II, Priority Action (A-81-88)
>
> Require air traffic control facilities to maintain current area maps that are standardized and coordinated with those used by local police and search and rescue authorities so that accurate search areas can be readily identified. (Class II, Priority Action) (A-81-89)
>
> Issue an Airworthiness Directive to require that Beech kit No. 101-3062-1 be installed on all Beech aircraft which have the remote ELT switch installed. (Class II, Priority Action) (A-81-90)
>
> Issue a General Aviation Airworthiness Alert advising all owners of ELT Model CIR-11-2 that they should obtain an updated owner's manual, Document 950012, for use in the installation and operation of this unit. The changes in the manual should also be summarized in the Airworthiness Alert. (Class II, Priority Action) (A-81-91)

DRIVER, Vice Chairman, and McADAMS, Member, concurred in these recommendations. KING, Chairman, and BURSLEY, Member, did not participate.

James B. King

By: James B. King
Chairman

GOLDMAN, Member, concurred in Recommendations A-81-89 through 91, but disapproved Recommendation A-81-88 and filed the following comments:

I do not believe Recommendation A-81-88 is justified, even though I agree with its general objective. We must always strive to minimize the opportunity for human error. Nevertheless, this special investigation was based on only one accident and did not include a thorough evaluation of the existing procedures, training, or supervision. Therefore, the "human error" identified in this accident may have been an isolated incident not justifying the breadth of the recommendation.

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 26, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-92

On February 11, 1981, a Lockheed JetStar Model 1329, operating as a corporate flight for the Texasgulf Aviation, Inc., from Toronto, Canada, to Westchester County Airport crashed on an instrument landing system (ILS) approach to runway 16 at Westchester County Airport, near White Plains, New York. The aircraft crashed about 6,000 feet from the approach end of runway 16 and about 2,300 feet to the right of the ILS centerline. The aircraft was about 360 feet below the glide slope when it first hit trees. The aircraft was destroyed, and the eight occupants were killed.

During the flight from Toronto to Westchester County, the flightcrew reported that they had lost a navigational radio and that they had difficulty with the landing gear after takeoff. They did not report any other problems during the flight.

During the investigation, the Safety Board learned that the aircraft electrical system had been modified by incorporation of Federal Aviation Administration Supplemental Type Certificate (STC) No. SA 1596 CE on January 30, 1981. This modification consisted of wiring changes and replacement of the generator control units (GCU) with new, solid state units manufactured by the Phoenix Aerospace, Inc., Phoenix, Arizona.

Following installation of the STC by AiResearch Aviation, Inc., the aircraft was ground checked to verify operation of the electrical systems. The No. 4 generator system malfunctioned and was repaired. Test flights were performed on January 31, to check out the engines and the electrical systems operations. During those test flights, the No. 2 generator tripped in flight and was reset; shortly thereafter, Nos. 1, 2, and 3 generators tripped and were reset; before the flight landed, all four generators tripped. AiResearch personnel found a problem in the aircraft wiring and repaired it. Another test flight was conducted and the No. 2 generator tripped; the generator was reset and operated satisfactorily for the rest of the flight. No maintenance was performed as a result of this malfunction.

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On February 1, 1981, the aircraft was dispatched on a company flight to Chicago, Illinois, during which the No. 2 generator tripped twice. On the return flight at night from Chicago to Westchester County Airport, the Nos. 1, 2, and 3 generators tripped at the same time; they were reset but they tripped again about 10 minutes later. The crew reset Nos. 1 and 4 generators and they continued to operate for the remainder of the flight. Colt Electronics and Phoenix Air Space personnel inspected and repaired the system. A subsequent test flight was conducted and when the speed brakes were extended No. 2 generator dropped off the line. It was reset and operated normally. No maintenance was performed after this flight.

On February 11, 1981, the morning of the accident, the aircraft was dispatched to Toronto, Canada. En route, the No. 2 generator tripped, was reset and tripped again. Later in the flight, all the generators tripped and were off for 9 minutes before they reset. The aircraft landed safely at Toronto and the copilot, who was a certificated mechanic, discussed the problem with the director of maintenance for Texasgulf. The Safety Board could not determine what, if any, maintenance was performed on the aircraft before the return flight to Westchester County.

Our investigation indicated that both d.c. and a.c. electrical power were available for systems operation during the approach to Westchester County Airport down to about 1,000 feet m.s.l. and when the aircraft struck the ground. The Safety Board has not been able to determine the cause of the loss of the navigational radio. We also have not been able to determine whether there was an interruption in electrical power during the approach that was corrected by the crew before impact.

A sister aircraft owned by Texasgulf was similarly modified and had similar problems. After the accident on February 11, 1981, the STC was removed from this aircraft and the wiring was restored to its original configuration.

The Safety Board is aware that modifications similar to STC SA1596 CE were made to two other Lockheed Model 1329 aircraft using similar components. The operators of these aircraft reported that they had problems with the electrical systems similar to those described above. They have subsequently had the systems corrected and they are now working satisfactorily.

In view of the problems associated with the installation of this STC in N520S and its sister aircraft, and in view of the possibility that an electrical malfunction may have been a causal factor in this accident, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Review the approval of Supplemental Type Certificate SA 1596 CE and the effect of the installation of the STC in Lockheed JetStar Model 1329 aircraft. (Class II, Priority Action) (A-81-92)

McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation. KING, Chairman, and DRIVER, Vice Chairman, did not participate.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 26, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-81-93

On September 2, 1980, an Israel Aircraft Industries Model 1124 experienced a cabin fire while cruising at 35,000 feet near Iowa City, Iowa. Most of the pilot's instruments failed; the pilot's instrument lights went out; the computer for the left engine fuel control became inoperative; and control of several other systems was lost. Warning lights did not come on, and no circuit breaker opened. The fire was extinguished but reignited twice during the descent and landing. Because fuel could not be dumped, an overweight (21,000 pounds) night, emergency landing was accomplished. Landing flaps and thrust reversing were unavailable, the antiskid was inoperative, and because heavy braking was used, the brakes caught fire and subsequently failed. As a result, the aircraft overran the runway and stopped beyond the end where the passengers and crew disembarked. The fire department extinguished the fire. There were no injuries; however, the aircraft was substantially damaged.

The Safety Board's investigation disclosed that a wire bundle located behind a coffeemaker chafed and shorted to the rear of the coffeemaker container case. As a result, the bundle burned through and separated. The wire bundle contained communication and accessory distribution wiring to the cockpit from the remote-control circuit breaker panel located in the aft luggage compartment. The remote-control circuit breaker (100 amp) used to protect the accessory and communications bus did not open. The remote-control circuit breaker is designed to provide protection through a thermal sensor which opens a 0.5-amp circuit breaker in the cockpit. Both the 0.5-amp circuit breaker and the remote-control circuit breaker were tested, and they functioned properly.

On September 3, 1980, the manufacturer took action to reroute the wire bundle so that it could not contact the coffeemaker. The Federal Aviation Administration subsequently issued Airworthiness Directive (AD) 80-19-15 to remove the potential of chafing. However, the AD did not require any modification of the circuit protection.

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As required in 14 CFR 25.1357, Circuit Protective Devices, automatic protective devices must be used to minimize distress to the electrical system and hazard to the airplane in the event of wiring faults or serious malfunction of the system or connected equipment. With regard to this incident, the Safety Board believes that the aircraft's automatic electrical circuit protection should have prevented the overheating and fire that destroyed important electrical wiring. Further, we believe that the provisions of 14 CFR 25.1357 were not satisfied in that the installed automatic protection device did not open the circuits it was designed to protect.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Evaluate the adequacy of the electrical system fault protection devices on Israel Aircraft Industries 1124 aircraft to ensure that the protective devices will minimize hazards to the aircraft when short circuits occur. (Class II, Priority Action) (A-81-93)

KING, Chairman, McADAMS, and GOLDMAN, Members, concurred in this recommendation. DRIVER, Vice Chairman, and BURSLEY, Member, did not participate.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 31, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-94 and -95

About 1630 c.s.t. on January 30, 1980, a Rockwell Aero Commander 690A, XB-AEA, crashed 9 miles south of the Will Rogers Airport, Oklahoma City, Oklahoma. The aircraft was en route from Dallas, Texas, to Oklahoma City, Oklahoma, on an instrument flight rules (IFR) flight plan. At 1338 c.s.t., a specialist at the Fort Worth Flight Service Station (FSS) Fort Worth, Texas, briefed the pilot. Subsequent investigation by the Safety Board revealed that the weather briefing the pilot received was not performed in accordance with Flight Services Handbook 7110.10. During the briefing, the specialist did not inform the pilot of a National Weather Service (NWS) forecast for significant icing in Oklahoma.

On February 12, 1980, Beech Baron N1ZW crashed about 1905 e.s.t. while attempting an instrument landing system (ILS) approach to runway 23 at Saranac Lake, New York. The aircraft was on an IFR flight plan from Teterboro, New Jersey, to Saranac Lake, New York. About 1531 e.s.t., the pilot of N1ZW called a specialist at the Teterboro FSS and requested a weather briefing. Investigation by the Safety Board revealed that the weather briefing provided to the pilot by the specialist was not performed in accordance with the Flight Services Handbook. During the weather briefing, the pilot did not receive NWS forecasts for occasional moderate turbulence and light to occasionally moderate icing that were pertinent to the route of flight of N1ZW.

In addition to the two accidents cited above, the Safety Board has investigated four other accidents in 1980 1/ in which the weather briefing provided to the pilot by the FSS specialist was not performed in accordance with the Flight Services Handbook. Again, noncompliance with the procedures in the Handbook resulted in the omission of critical weather information during the briefing. Since the safety of

1/ Beech Aircraft Bonanza (BE-35), N621T, February 14, 1980, Barksdale, Texas - Fort Worth,Texas FSS. Cessna Aircraft (C-172), N3912F, May 10, 1980, Napanee, Indiana - South Bend, Indiana FSS. Grumman American (AA5B), N28252, October 16, 1980, Madill, Oklahoma - Oklahoma City, Oklahoma FSS. Beech Aircraft Baron (BE-55), N171W, October 29, 1980, Canisteo, New York - Buffalo, New York FSS.

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flight depends on the availability of critical weather information to the pilot, the Safety Board believes that the FAA must take steps to ensure that FSS personnel comply with the weather briefing procedures in Flight Services Handbook 7110.10. 2/

The FAA is responsible for monitoring the quality and content of weather briefings. One method, which is considered the most efficient, is the review of audio-recorded weather briefings at FSS's. However, only about 40 percent of the FSS's have this capability. The Safety Board believes that by expanding the audio-recording capability to all FSS's the monitoring process will be enhanced and consequently the quality and content of weather briefings provided by FSS personnel will be improved.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Audio-record all weather briefings provided by FSS personnel and retain such records for a reasonable period of time. (Class II, Priority Action) (A-81-4)
>
> Take steps to ensure that all FSS personnel who provide weather briefings comply with the weather briefing procedures published in Flight Services Handbook 7110.10. (Class II, Priority Action) (A-81-95)

KING, Chairman, DRIVER, Vice Chairman, and GOLDMAN and BURSLEY, Members, concurred in these recommendations. McADAMS, Member, did not participate.

By: James B. King
Chairman

2/ For more information read "Special Investigation Report: Flight Service Station Weather Briefing Inadequacies." (NTSB-SIR-81-3.)

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 10, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-96

On September 3, 1980, the nose landing gear on a Piper PA-32R, N2252Q, slowly collapsed during rollout after a normal landing at Raeford, North Carolina. The pilot stated that just before touchdown he saw three green landing gear light indications.

Examination of the nose landing gear assembly revealed that the nose landing gear downlock retaining screw, P/N 410011, was loose, worn, and bent. The retaining nut, P/N 404887, had backed off but was still on the threads. This looseness in the retaining nut allowed the eccentric bushing, P/N 35662-02, to rotate and slide. This would randomly result in misalignment of the nose gear downlock, P/N 38078-02, and the downlock bearing (fixed). Although the microswitch could engage and illuminate the green nose gear landing light on the instrument panel, the mechanical downlock would not necessarily be positively engaged.

The aircraft records indicated the last annual inspection was accomplished in November 1979 (total aircraft time was 1550.0 hours). The last 100-hour inspection was accomplished on February 23, 1980 (total aircraft time was 1650.0 hours). The total time on the aircraft at the time of the incident was 1,673.84 hours.

On April 10, 1981, a Federal Aviation Administration (FAA) Systems Analysis and Summary Report was issued which pointed out that a review of Service Difficulty Reports indicated an upward trend in nose landing gear downlock failures in PA-32R aircraft. There were 18 reports over a 4-year period ending March 5, 1981. Nine of these reports were received during the period April 21, 1980, through March 5, 1981.

In addition, a review of FAA accident/incident reports shows that there have been nine incidents in which the nose landing gear has collapsed due to a failure of the nose landing gear downlock, P/N 38078-02. One incident occurred in 1978, six occurred in 1980, and two occurred in 1981. The cutoff date for these data was March 13, 1981.

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Examination of the Safety Board's briefs of accidents involving Piper PA-32 aircraft where landing gear was a cause/factor (1975-1979) shows no incidents or accidents resulting from failure of the nose landing gear downlock assembly.

The Safety Board is aware that the FAA is currently evaluating a draft of Piper Aircraft Corporation's Service Bulletin No. 720. This draft would announce the availability of a Nose Landing Gear Modification Kit, P/N 764-135V, that when installed will maintain the designed structural integrity and proper function of the nose landing gear downlock system. Compliance with this modification is proposed at the next regularly scheduled inspection event but not to exceed the next 100 hours of operation after the bulletin is issued.

Since the unsafe conditions found on the incident aircraft might be present on other PA-32R aircraft, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Airworthiness Directive making the provisions of Piper Aircraft Corporation Service Bulletin No. 720 mandatory for all PA-32R series aircraft. (Class II, Priority Action) (A-81-96)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

James B. King

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 4, 1981
CORRECTED COPY

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-97 and -98

About 2003 e.s.t. on April 8, 1981, Eastern Airlines flight 60 from New Orleans, Louisiana, to New York made an emergency, gear-retracted landing on runway 22R at John F. Kennedy (JFK) International Airport, Jamaica, New York. The landing of the Boeing 727 was followed by an emergency evacuation of the aircraft. All 67 passengers and 6 crewmembers were evacuated without injury. 1/

The flightcrew, in preparation for landing, placed the landing gear lever into the down position but the green light indicating that the left landing gear was "down and locked" did not illuminate. The flightcrew, following the procedure prescribed in the Eastern flight manual for a "LANDING GEAR UNSAFE CONDITION," tested the light, retarded one of the throttles to idle to sound the landing gear horn, and visually checked the landing gear "down-and-locked" position indicators through the appropriate viewing ports.

The main landing gear position indicators can only be seen through the viewing ports located in the cabin floor of the accident aircraft near the rear wing spar between rows 21 and 22. The flight engineer reportedly had some difficulty in locating the viewing ports and in removing the carpet which covered the ports. He said that when he looked through the ports, the right gear position indicator showed a gear "down-and-locked" position but the left gear position indicator was not visible and he saw--"nothing but metal." The tire and the rim are partially visible through the port when the gear is retracted.

The flightcrew recycled the landing gear and attempted to manually extend the gear. However, they did not attempt again to visually verify the landing gear position as specified in the Eastern Flight Manual under the "MANUAL GEAR EXTENSION" procedure after additional attempts were made to hydraulically and manually extend the left main landing gear. The flightcrew relied solely on cockpit indications from the gear indicator lights and the landing gear warning horn. Finally, based on the cockpit indications, the captain concluded that the left gear was not "down and locked," and he decided to land with the gear retracted.

1/ For more detailed information, read Aircraft Incident Report—"Eastern Airlines Boeing 727-25, N8140N, John F. Kennedy International Airport, Jamaica, New York, April 8, 1981" (NTSB-AAR-81-14).

Subsequent operational tests of the left landing gear revealed no mechanical failures which would have precluded its proper operation. However, the left gear "down-and-locked" indicator microswitch was found to be defective because of an abnormally high internal resistance. Since the microswitch was common to both the landing gear indicator system and the landing gear warning horn system, a failure of the microswitch in an essentially open position would not have illuminated the indicator light and would have sounded the warning horn when a throttle was retarded to the idle position. Thus, a "LANDING GEAR UNSAFE CONDITION" was indicated even though the landing gear may have been "down and locked." Therefore, the prescribed visual check was the only redundancy for determining the position of the landing gear.

The Safety Board believes that the flightcrew's lack of familiarity with the operation of the landing gear and its electrical and mechanical position indicating system and the insufficient information provided in the flight manual led the crew to rely on potentially erroneous cockpit cues. If additional information had been provided to the crew on the operation of the electrical indicating system, they might not have relied solely on the cockpit indicators and might have realized the critical need for visual verification of landing gear status after resorting to the manual gear extension procedures.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require the revision of air carrier operator flight manuals for the Boeing 727, as needed, to illustrate the location of the landing gear position indicator viewing ports in the passenger cabin, and to provide a pictorial presentation of the gear in the fully retracted position and the indicator in and out of the "down-and-locked" position when viewed through the port. (Class II, Priority Action) (A-81-97)
>
> Require the revision of the abnormal procedures section of Boeing 727 air carrier operator flight manuals, as needed, regarding the landing gear unsafe indication, to include additional information relevant to the gear position indicator lights and the landing gear warning horn system, and the fact that they are not independent and are not redundant landing gear position indicating systems. (Class II, Priority Action) (A-81-98)

KING, Chairman, and GOLDMAN and BURSLEY, Members, concurred in these recommendations. DRIVER, Vice Chairman, and McADAMS, Member, did not participate.

James B. King

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 4, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-99 and -100

On December 3, 1980, Ransome Airlines Flight 944, a Nord 262, experienced a rapid decompression at 8,000 feet m.s.l. when the main cabin door opened in flight. As a result, one passenger sustained minor injuries. The flight made an emergency landing at Groton, Connecticut, without further incident. The National Transportation Safety Board's investigation of this incident revealed that the door had not been properly closed and locked.

The aircraft departed Providence, Rhode Island, on a scheduled passenger flight to Newark, New Jersey. When the flight was climbing through about 6,000 feet m.s.l. with the cabin altitude selected at sea level, the flight attendant, after being unable to see the latching fingers within the main cabin door through the viewing windows, notified the captain that they did not appear normal. The flight attendant's training manual references centering lines painted on the viewing windows of the cabin door which enables the flight attendant to observe the correct latching finger engagement, a red door lock safety latch, and the associated red lock tab. However, on this aircraft, there were no centering lines on the viewing windows, and the door lock safety latch and the associated lock tab were not painted red.

The flight attendant asked the captain if she should "jiggle" the door handle; the captain told her to leave it alone. Although the flight continued to climb to a higher altitude, the crew did not attempt to verify the condition of the main cabin door. Shortly thereafter, as the flight attendant entered the aft galley, the main cabin door opened outward resulting in a rapid decompression of the cabin. One passenger received minor injuries as a result.

Examination of the aircraft disclosed that ten ceiling panels were pulled loose and four wall panels were distorted inward. The interior of the cabin was strewn with insulation and soundproofing material. The entrance door to the cockpit had separated from its attachment points and was lodged in the forward cabin aisle.

The upper and lower door sections of the main cabin door were removed from the aircraft and tested for proper locking. The door handle was closed slowly and the door microswitch for the annunciation warning light tripped to the closed position. The latching fingers were then visible through the viewing windows. The door handle was rotated an additional 25° before the lock safety latch positively engaged.

The aircraft maintenance log for November 11, 1980, stated "Passenger entrance door switch for annunciator warning light is sticking, indicates door is locked when open." The corrective action indicated in the log was, "could not duplicate, test ok." On November 28, 1980, it was reported in the maintenance log that, "the left spade indicates lower than the right one when the door is closed and locked." The corrective action indicated was, "adjusted spade indicator." The Safety Board believes that the maintenance action, which involved bending of the latching fingers, taken on November 28, 1980, to correct the problem only changed the indication of the latching fingers and did not ensure their proper engagement.

Although the aircraft operator's flight manual does not specifically address procedures to be followed if a potential leak exists in the pressurized cabin, safe operating practices dictate that the cabin pressure be decreased immediately to reduce the forces that could cause a leak and decompression. The continuation of the climb with the cabin pressurized and with the cabin altitude selected at sea level further aggravated an unsafe situation.

In view of the potential catastrophic situation created by inflight opening of doors on pressurized cabins--ejection of crewmembers or passengers, injury to passengers during the decompression, and possible structural damage with attendant adverse effects on airplane controllability, the Safety Board recommends that the Federal Aviation Administration:

> Review the flight operations manuals and flight attendant's manual of all commuter airlines operating Nord 262 aircraft to insure that they include appropriate information regarding procedures to be followed when a potential leak is identified in pressurized cabins. (Class II, Priority Action) (A-81-99)
>
> Require on Nord 262 aircraft that the markings on the main cabin doors, viewing window centering lines, red door lock safety latch, and latch lock tab conform to those described in the flight attendant's manual. (Class II, Priority Action) (A-81-100)

KING, Chairman, DRIVER, Vice Chairman, GOLDMAN and BURSLEY, Members, concurred in these recommendations. McADAMS, Member, did not participate.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED:

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-101 and -102

On September 1, 1981, a Robinson R-22 helicopter, N9065D, crashed and burned in a wooded area of Granby, Connecticut; the pilot and passenger were killed. The Safety Board's on-going investigation of the accident has revealed that one of the main rotor blades separated in-flight. Preliminary metallurgical examination in the Safety Board's laboratory revealed a fatigue failure in the root area of the blade where the blade spar attaches to the root rib fitting. Fatigue had progressed across 70 percent of the blade's cross-section. The root area of the spar and fitting are completely enclosed by the external blade skin and cannot be inspected visually. Service time on the main blade, PNA016-1, was about 690 hours.

At this time, a more detailed metallurgical examination is in progress. However, the Safety Board is concerned that other main blades on Robinson R-22 helicopters may be in the same condition; therefore, we believe that immediate action is warranted to prevent similar accidents.

Accordingly, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an immediate Airworthiness Directive to establish a retirement time on the Robinson R-22 main rotor blades based on the service time of the failed blade. (Class I, Urgent Action) (A-81-101)
>
> Develop and implement an inspection technique for the main rotor blades to detect progressive fatigue in the area of the rib root fitting. (Class I, Urgent Action) (A-81-102)

KING, Chairman, DRIVER, Vice Chairman, and BURSLEY, Member, concurred in these recommendations. McADAMS and GOLDMAN, Members, did not participate.

By: James B. King
Chairman

3356

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 24, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-115 through -118

The National Transportation Safety Board has issued a safety report on the hazards of aircraft structural icing, including the physical aspects of the problem as it relates to aircraft, methods of avoidance and/or prevention, the adequacy of icing forecasts, and the certification of aircraft for flight into known icing conditions. 1/

The Safety Board has recommended that the Acting Federal Coordinator for Meteorological Services and Supporting Research take appropriate action to refine the measurement and forecasting of meteorological elements involved in aircraft icing. A copy of the correspondence is enclosed for your information and such coordination as you may deem necessary.

Once this technology has been developed, forecasts should describe icing conditions directly in the applicable parameters (liquid water content, drop size distribution, and temperature). To make these forecasts useable, aircraft maintenance will have to evaluate their aircraft under varying conditions of the meteorological parameters and establish their effect upon specific aircraft.

The criteria for certificating aircraft for flight into known icing conditions contained in 14 CFR 25 are based almost entirely upon icing studies conducted by the National Aeronautics and Space Administration in the late 1950's using current transport aircraft and considering cloud droplets as a moisture source. Ice crystal/droplet mixtures and freezing rain were not considered. The Safety Board believes the icing criteria in 14 CFR 25 should be reviewed in light of the latest knowledge of cloud physics and the characteristics of modern aircraft. In addition, the procedures used by aircraft manufacturers to certificate aircraft under 14 CFR 25 should be reviewed to determine that they are representative of conditions found in nature and cover as much as possible.

1/ For more detailed information read "Safety Report--Aircraft Icing Avoidance and Protection" (NTSB-SR-81-1).

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Evaluate individual aircraft performance in icing conditions in terms of liquid water content, drop size distribution, and temperature, and establish operational limits and publish this information for pilot use. (Class III, Longer-Term Action) (A-81-115)
>
> Review the icing criteria published in 14 CFR 25 in light of both recent research into aircraft ice accretion under varying conditions of liquid water content, drop size distribution, and temperature, and recent developments in both the design and use of aircraft; and expand the certification envelope to include freezing rain and mixed water droplet/ice crystal conditions, as necessary. (Class III, Longer-Term Action) (A-81-116)
>
> Establish standardized procedures for the certification of aircraft which will approximate as closely as possible the magnitudes of liquid water content, drop size distribution, and temperature found in actual conditions, and be feasible for manufacturers to conduct within a reasonable length of time and at a reasonable cost. (Class III, Longer-Term Action) (A-81-117)

Furthermore, during the background investigation for this report, an examination of 14 CFR 91.209(c) and 135.227(c) revealed that the content of the regulations is not consistent with the definition of severe icing contained in the Airman's Information Manual (AIM) and used by the National Weather Service. The AIM definition indicates "that the rate of accumulation (of ice) is such that deicing/anti-icing equipment fails to reduce or control the hazard. Immediate diversion is necessary."

Title 14 CFR 91.209(c) states that "except for an airplane that has ice protection provisions that meet the requirements in Section 34 of Special Federal Aviation Regulation No. 23 or those for transport category airplane-type certification, no pilot may fly an airplane into known or forecast severe icing conditions." Similarly, 14 CFR 135.227(c) states that "except for an airplane that has ice protection provisions that meet Section 34 of Appendix A, or those for transport category airplane-type certification, no pilot may fly an aircraft into known or forecast severe icing conditions."

Even though 14 CFR 91.209(c) and 135.227(c) indicate that aircraft with certain anti-icing/deicing equipment are permitted to fly into known or forecast severe icing conditions, the AIM definition of severe icing states that such equipment will not reduce or control the severe icing hazard. The Safety Board believes that clarification of the regulations is necessary.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration, as an interim priority measure:

> Reevaluate and clarify 14 CFR 91.209(c) and 135.227(c) to insure that the regulations are compatible with the definition of severe icing established by the Federal Coordinator for Meteorological Services and Supporting Research as published in the Airman's Information Manual. (Class II, Priority Action) (A-81-118)

KING, Chairman, DRIVER, Vice Chairman, and GOLDMAN and BURSLEY, Members, concurred in these recommendations. McADAMS, Member, did not participate.

James B. King

By: James B. King
Chairman

Enclosure

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 24, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-119 and -120

On December 30, 1980, a Summit Airlines Convair 580, N531SA, was being operated as a scheduled domestic cargo flight between Norfolk, Virginia, and Baltimore, Maryland. After departing Norfolk, Virginia, the aircraft began to pitch-up beyond the normal 8° climb attitude as it was climbing through 500 feet mean sea level. The captain reported that he pushed the yoke forward but the aircraft did not respond. The flightcrew regained a level attitude by reducing power to flight idle and retracting the flaps. The crew reapplied power and continued the flight to Baltimore-Washington International Airport. The flight controls responded normally during the remainder of the flight and during landing.

Examination of the aircraft disclosed that the 12 aluminum rivets which secured the left elevator torque tube to the torque tube collar in the empennage had failed. The failed rivets allowed the left elevator torque tube to rotate freely and independently of the pilot's control movements. There was no other elevator or elevator control damage.

The fracture surfaces of portions of eight torque tube collar rivets were examined by an independent engineering testing company. The examination revealed that: (1) the failures were caused essentially by shear stress at various locations along the shank of the rivets; (2) before the failure, the shanks of all the rivets were offset between 0.005 and 0.015 inch, indicating a looseness in the connection; and (3) the hardness of the aluminum rivets indicated that the rivets had been heat-treated.

A review of the Federal Aviation Administration (FAA) Service Difficulty Records between 1976 and 1981 revealed 20 incidents (excluding this incident) which involved elevator control malfunctions or control failures in Convair 580 aircraft. Eight incidents involved elevator flutter, buffet, or vibration usually in cruise at speeds above 180 knots. Three of the elevator flutter/buffet incidents involved N531SA. In all 20 incidents, other empennage control system components were replaced, but the torque tube collar rivets were not changed. According to FAA personnel, the elevator flutter problem is a fleet-wide problem which has been related to improperly fitted elevator/stabilizer shroud (aerodynamic seal) doors. The Safety Board concludes that the failed rivets were a result of shear forces which occurred after the rivets had been weakened previously during earlier inflight flutter/buffet incidents.

As a result of the December 30, 1980, incident, Summit Airlines maintenance personnel immediately published a Fleet Campaign Directive outlining mandatory procedures for the inspection of the torque tube collar rivets on all Summit Convair 580 aircraft. In addition, General Dynamics-Convair Division issued Service Bulletin 640(340D) 27-6, dated February 23, 1981, which recommends inspection and/or replacement of the elevator torque tube attachment fasteners. The inspection and rework outlined in the service bulletin are applicable to all Convair 340, 440, 640, and Allison-powered 340/440 (CV-580) aircraft.

Currently, about 135 aircraft in the United States are affected by Service Bulletin 640(340D) 27-6. Most are high-time aircraft, such as N531SA, and many may have elevator torque tubes secured by aluminum rivets. Some aircraft which have had elevator torque tube overhauls or bearing changes may have close-tolerance bolts or tapered pins which were authorized as replacements for the aluminum rivets in the March 2, 1956, General Dynamics-Convair 340/440 Newsletter Review and as republished in April 1959.

In view of these circumstances and the potential serious consequences of an elevator torque tube fastener failure, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Airworthiness Directive to require mandatory compliance with provisions of General Dynamics-Convair Division Service Bulletin 640(340D) 27-6, dated February 23, 1981. (Class II, Priority Action) (A-81-119)
>
> Determine the cause of and take appropriate action to prevent elevator vibration/flutter in Convair 340, 440, 640, and 580 aircraft. (Class II, Priority Action) (A-81-120)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 24, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-121

On August 7, 1980, a Convair 580, operated by Interstate Airlines, was on a regularly scheduled cargo flight when the nose gear failed to extend as the flight-crew prepared for landing. After several attempts to extend the nose gear, the flight returned to Logan International Airport, Boston, Massachusetts, and made an emergency landing with the nose gear retracted. The three crewmembers were not injured, but the aircraft was slightly damaged.

Postaccident inspection of the nose gear revealed that the right nose gear door hinge had failed and caused the right door to jam against the left door. The jammed doors prevented the nose gear from extending in flight.

Metallurgical examination of the hinge by the National Transportation Safety Board indicated that the failed hinge was fractured and that the fracture was typical of overstress separation in aluminum alloys. The source of the overstress forces is currently undetermined; however, there were significant deposits of rust which may have created high frictional loads located around the hinge bushing hole. The hinge bushing and pivot bolt were noticeably dry of any lubricants and did not appear to have been regularly lubricated.

A review of the lubrication section of the manufacturer's maintenance manual for the Convair 580 indicated that the nose gear door hinge bushings were impregnated with MIL-L-7870 oil at the time of installation and that they should be relubricated with the same oil during major inspections. However, the Interstate Airlines CV-580 maintenance manual, approved by the Federal Aviation Administration (FAA), and the Allegheny Airlines CV-580 airframe overhaul manual, which is used by Interstate Airlines, do not address this requirement nor provide instructions on lubrication of nose gear door hinge bushings.

A review of the FAA's Service Difficulty Reports for the last 5 years revealed one other incident in which the nose gear door hinge on a Convair 340 failed. The Convair 240, 340, 440, and 580 landing gear systems are similar.

The Safety Board is concerned that the maintenance manuals of other Convair 240, 340, 440, and 580 operators may not include the lubrication requirements for nose gear door hinge bushings. Inclusion of this information could prevent further gear-up landings caused by jammed doors.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue a maintenance bulletin to notify Convair 240, 340, 440, and 580 inspectors, operators, and owners that, at major inspections, the nose gear door hinge bushings should be lubricated with MIL-L-7870 oil according to the manufacturer's maintenance manual. (Class II, Priority Action) (A-81-121)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 21, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-124 through -127

The National Transportation Safety Board has under investigation an in-flight accident involving a World Airways, Inc. DC-10-30 aircraft while en route from Baltimore-Washington International Airport U.S.A., to Gatwick International Airport, U.K., on September 19, 1981.

Preliminary information indicates that a flight attendant was attempting to remove a service cart from the personnel lift in the lower galley when the lift started moving upward. The flight attendant became lodged between the top of the service cart and the top of the lift's doorway opening and as a result sustained fatal injuries.

The reason the lift started moving upward with the lower galley lift door open has not yet been determined. An interlock system is installed to prevent energizing the lift motor and thus raising or lowering the lift while either the upper or lower lift door is open. However, the Safety Board's investigation has disclosed that lifts have been observed to operate with one of the doors open. The Safety Board is thus concerned about the location of the electrical interlock switches. The switches are located in an area where they can be damaged by service carts or accidently activated by a flight attendant while trying to remove a service cart.

A review of the service history of the galley lift system revealed that in July 1979 the Douglas Aircraft Company issued Service Bulletin 25-266 following two instances in which operators had reported that the galley lift system had operated with a lift door open. The Service Bulletin stated that the electrical interlock switches had failed due to contamination by various types of foreign liquid substances. The Service Bulletin also stated that this condition could result in injury to flight personnel if the lifts are operated while the lift doors are open.

While the Safety Board's preliminary investigation indicates that this Service Bulletin had been incorporated on the accident airplane, we note that this occurrence further exemplifies the extreme hazard of this situation. We believe that in addition to mandatory compliance of the Service Bulletin and interim procedures to prevent another accident, the design of the entire interlock system should be changed to eliminate the potential for damage to the interlock switches.

Furthermore, our preliminary investigation indicates that the trapped flight attendant was not immediately released. Although the reason for the delay has not been determined, the Safety Board is concerned that the other flight attendants may not have been sufficiently knowledgeable about the lift circuitry design and emergency operational methods to have effected a release.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Operations Alert Bulletin to all operators of DC-10 aircraft notifying them of the circumstances of this accident and informing them to implement procedures or temporary circuitry changes which would prohibit flight attendants in the main cabin service center from activating the galley personnel lift upward from the lower lobe galley without verbal confirmation that all personnel are clear and the lower lift door closed. (Class I, Urgent Action) (A-81-124)
>
> Issue an Airworthiness Directive to require affected DC-10 operators to immediately comply with the Douglas Aircraft Company's Service Bulletin 25-266. (Class I, Urgent Action) (A-81-125)
>
> Require a redesign of the galley personnel and food cart lift doors and door frames to relocate the interlock switches to a position where they would not be susceptible to damage by food service carts, to inadvertant contact by personnel attempting removal of food service carts, and to contamination by foreign substance. (Class I, Urgent Action) (A-81-126)
>
> Review DC-10 operator training programs for flight attendant personnel and flightcrews to assure that they include a description and discussion of the galley lift system including the electrical circuitry, location of circuit breakers, function of door interlock switches, and emergency operating procedures. (Class I, Urgent Action) (A-81-127)

KING, Chairman, DRIVER, Vice Chairman, and BURSLEY, Member, concurred in these recommendations. GOLDMAN and McADAMS, Members, did not participate.

James B. King

By: James B. King
Chairman

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